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U.S. Department of the Interior
Bureau of Land Management
Casper District Office

Platte River Resource Area
May 1998

Environmental Assessment of Intoil, Inc.'s Cooper Reservoir Natural Gas Development Project

Natrona County, Wyoming

99-000150

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The Bureau of Land Management is responsible for the balanced management of the public lands and resources and their various values so that they are considered in a combination that will best serve the needs of the American people. Management is based upon the principles of multiple use and sustained yield: a combination of uses that take into account the long term needs of future generations for renewable and nonrenewable resources. These resources include recreation, range, timber, minerals, watershed, fish and wildlife, wilderness and natural, scenic, scientific and cultural values.

BLM/WY/PL-98/016+1310

WY-067-98-025

This Environmental Assessment was prepared by Anderson Environmental Consulting, an independent environmental consulting firm, with the guidance, participation and independent evaluation of the Bureau of Land Management (BLM). The BLM, in accordance with Federal Regulation 40 CFR 1506.5 (a) & (b), is in agreement with the findings of the analysis and approves and takes responsibility for the scope and content of this document.

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Casper District Office
1701 East E Street
Casper, Wyoming 82601-2167

1793/Cooper Reservoir Natural
Gas Development Project

MAY 1 1 1998

Dear Reader:

This Environmental Assessment (EA) on the proposed Cooper Reservoir Natural Gas Development Project is submitted for your review and comment. Copies have been sent to parties who attended the scoping open house or who provided written comments on the proposed development. This EA analyzes the potential impacts from natural gas development proposed by Intoil, Inc. The Cooper Reservoir project area is located in Natrona County approximately 50 miles west of Casper, Wyoming, and is situated primarily south of Waltman, Wyoming.

Intoil proposes to drill up to 73 wells over the next 5 to 10 years, in addition to the 12 currently in place, to obtain maximum recovery of natural gas from existing, Federal, State, and private oil and gas leases. Additional roads are required to provide for vehicle access and new pipelines would be necessary to link the wells with existing transportation pipelines. Expansion of the existing natural gas compression facility is also proposed.

The 30 day comment period ends on June 15, 1998. Please send your comments to:

Linda M. Slone, Project Coordinator
Bureau of Land Management
Platte River Resource Area
P.O. Box 2420
Mills, WY 82644

The technical reports and other supporting material referenced in the document are available for review at the Platte River Resource Area Office.

Comments, including names and street addresses of respondents, will be available for public review at the above address during regular business hours (7:45 a.m. to 4:30 p.m.), Monday through Friday, except holidays, and may be published as part of the EA. Individual respondents may request confidentiality. If you wish to withhold your name or street address from public review or from disclosure under the Freedom of Information Act, you must state this prominently at the beginning of your written comment. Such requests will be honored to the extent allowed by the law. All submissions from organizations or businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, will be made available for public inspection in their entirety.

This EA is not the decision document. A Decision Record (DR) detailing the BLM's decision will be prepared and distributed following the end of the 30-day review period. The decision on the proposed natural gas project will be based upon the analysis in the EA and on public comments. The DR is anticipated to be issued on June 16, 1998.

The BLM appreciates the individuals, organizations, Federal, State, and local governments who participated in the environmental analysis process.

Sincerely,

District Manager

Attachment

ENVIRONMENTAL ASSESSMENT

of

INTOIL, INC.'S

COOPER RESERVOIR NATURAL GAS DEVELOPMENT PROJECT

NATRONA COUNTY, WYOMING

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May, 1998

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1.0 PURPOSE OF AND NEED FOR ACTION

1.1 INTRODUCTION

The Casper District Office, Bureau of Land Management has prepared this Environmental Assessment to evaluate and disclose the potential environmental impacts associated with additional natural gas exploration and development as proposed by Intoil, Inc. (Intoil) within the Cooper Reservoir Unit (CRU) and adjacent areas (project area) located in western Natrona County, Wyoming (Figure 1.1). Additional exploration and development within the Cooper Reservoir Natural Gas Development Project Area would generally consist of the following component activities:

- construction of up to 73 additional well locations within the overall project area;
- construction or reconstruction of approximately 34.39 miles of access road necessary to provide access to those well locations proposed by Intoil;
- installation of approximately 30.42 miles of buried natural gas pipeline for the gathering and transportation of gas produced from wells within the project area to a connection with an existing gas sales pipeline;
- installation of processing and production facilities, and the routine operation/maintenance of commercially productive wells within the field;
- expansion of existing gas compression to facilitate sales of natural gas produced within the project area; and
- abandonment and reclamation of individual well location and access roads as they are determined to be commercially non-productive.

In July, 1996, the Casper District Office, Bureau of Land Management (BLM) completed an Environmental Assessment (EA) and issued a Decision Record (USDI-BLM 1996) approving a proposal by Intoil to drill six (6) natural gas wells and construct associated facilities in the CRU (refer to Figure 1.2). The Decision Record stated that approval of the proposed action would not result in any undue or unnecessary environmental degradation and that the proposed action was in conformance with the Platte River Resource Area (PRRA) Resource Management Plan (RMP), which was approved in July, 1985 (USDI-BLM 1985a). Since the approval of the subject EA, the BLM has received additional proposals from Intoil to continue development in the CRU in an attempt to further define the productive limits of the Cooper Reservoir Natural Gas Field. These proposals have been precipitated by the commercial success of specific wells which were analyzed in the *Development of Federal Oil and Gas Leases in the Cooper Reservoir Unit During Preparation of the Cooper Reservoir Field Development Project Environmental Assessment* and subsequently drilled by Intoil in 1996 and 1997.

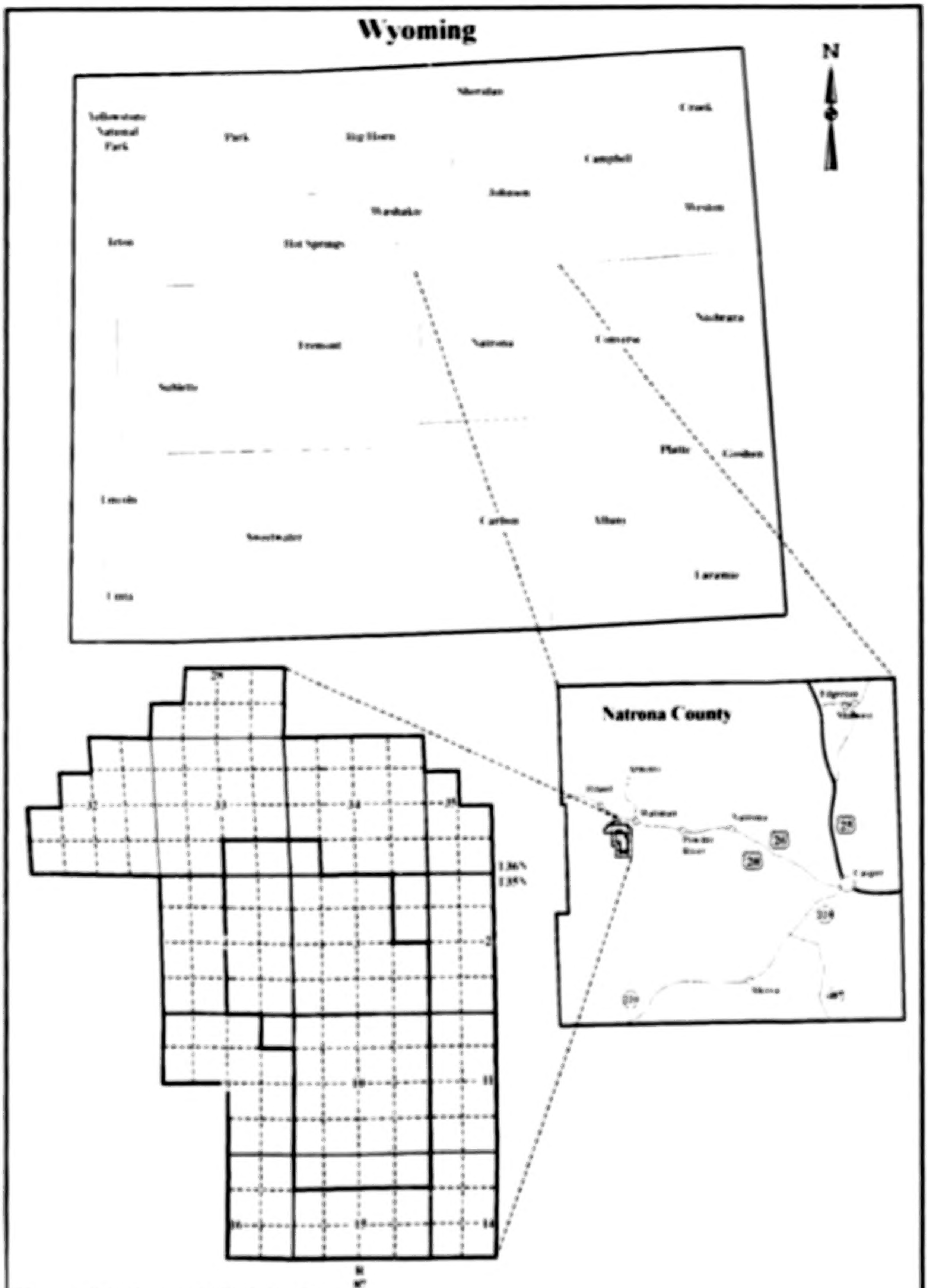

Figure 1.1 General Vicinity Map

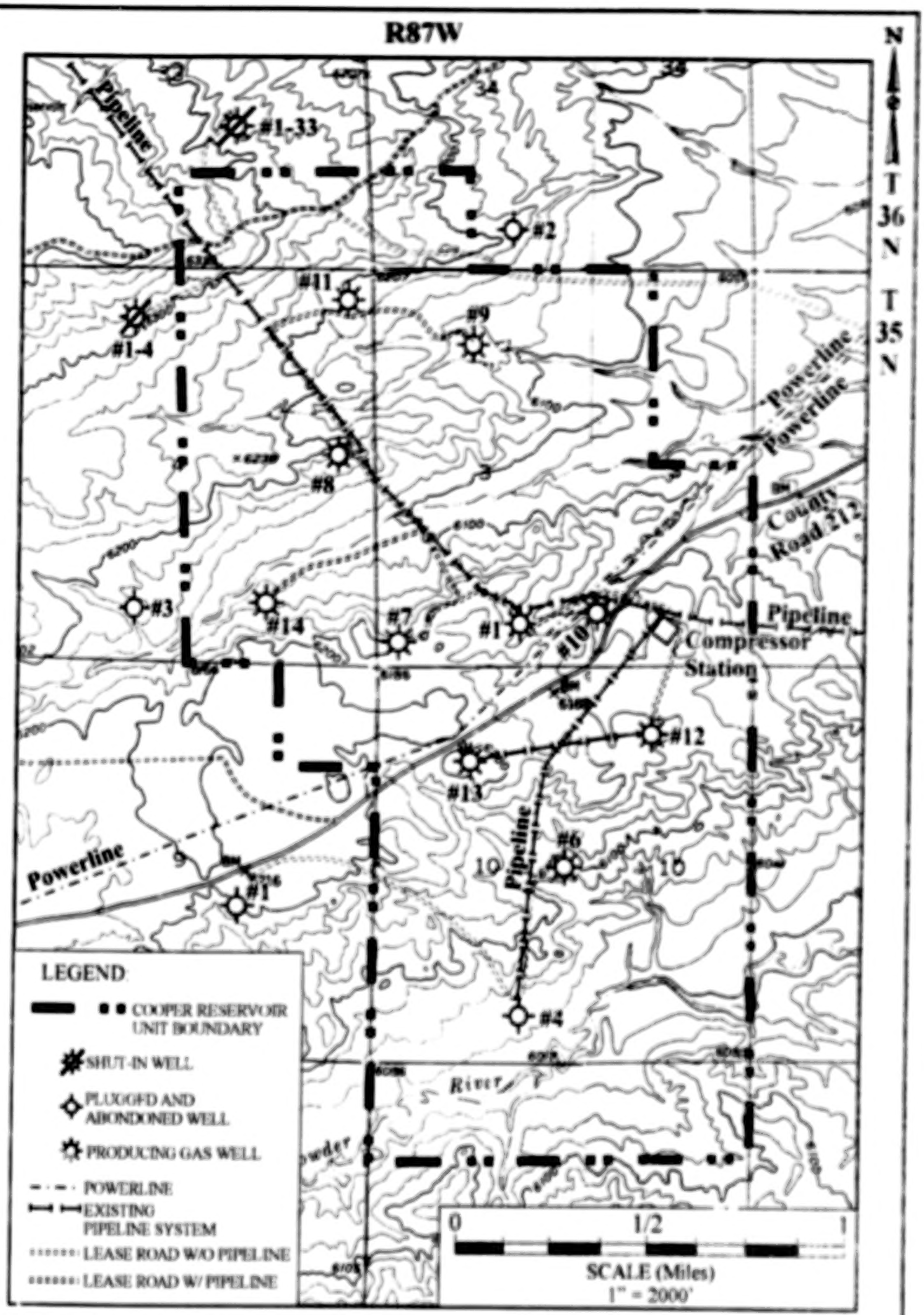

Figure 1.2 Cooper Reservoir Unit

The project area considered in the original Cooper Reservoir Unit EA encompassed those lands included within the CRU (+/- 1,560 acres) and a 280 acre lease owned by Prima Oil & Gas Company situated along the eastern boundary of the CRU. Intoil now proposes to drill up to a maximum of 73 additional wells within the expanded Cooper Reservoir Natural Gas Development Project Area (CRNGDPA) along with the roads, pipelines, and ancillary facilities necessary for the production of commercially successful wells drilled in conjunction with this expanded exploration and development proposal. These activities are hereafter referred to as the Proposed Action. Those lands potentially affected by implementation of the Proposed Action are defined as the "project area" and the boundaries of this project area are shown on Figure 1.3.

The initial Cooper Reservoir Unit EA was an interim analysis designed to allow Intoil to gather additional geologic information on leases within the CRU prior to the preparation of a more comprehensive Field Development Environmental Assessment - should drilling operations on the 6 initial wells warrant additional exploration and/or development of federal oil/gas leases within and/or adjacent to the CRU. In this regard, federal regulations require additional analyses of environmental consequences whenever the scope of a proposed action exceeds that examined in past documents prepared under the *National Environmental Policy Act* (NEPA). This Field Development EA incorporates the original Cooper Reservoir Unit EA by reference and expands upon that analysis as necessary to provide guidelines for the implementation of additional exploration and development within the expanded project area. Through interdisciplinary analysis and review, consideration of reasonable alternatives, and public participation, this EA will serve as a vehicle for:

- determining the significance of environmental impacts associated with the Proposed Action and alternatives;
- assisting in the decision-making process;
- deciding whether an Environmental Impact Statement (EIS) is necessary; and,
- identifying and developing appropriate mitigation measures to minimize the environmental impacts of the Proposed Action and alternatives.

1.2 PURPOSE AND NEED FOR THE PROPOSED ACTION

As indicated above, Intoil proposes to drill up to a total of 73 additional natural gas wells in the project area over a period of approximately 5 to 10 years. This activity would be in addition to the 19 well locations which have been previously approved and subsequently drilled within the project area; 7 of which have been plugged, abandoned, and the locations successfully reclaimed; and 12 of which are either currently producing, capable of production, or are being utilized for injection purposes within the CRNGDPA. Implementation of the Proposed Action would further define the productive potential of the Lower Fort Union and Lance Formations underlying existing oil/gas leases within the CRNGDPA.

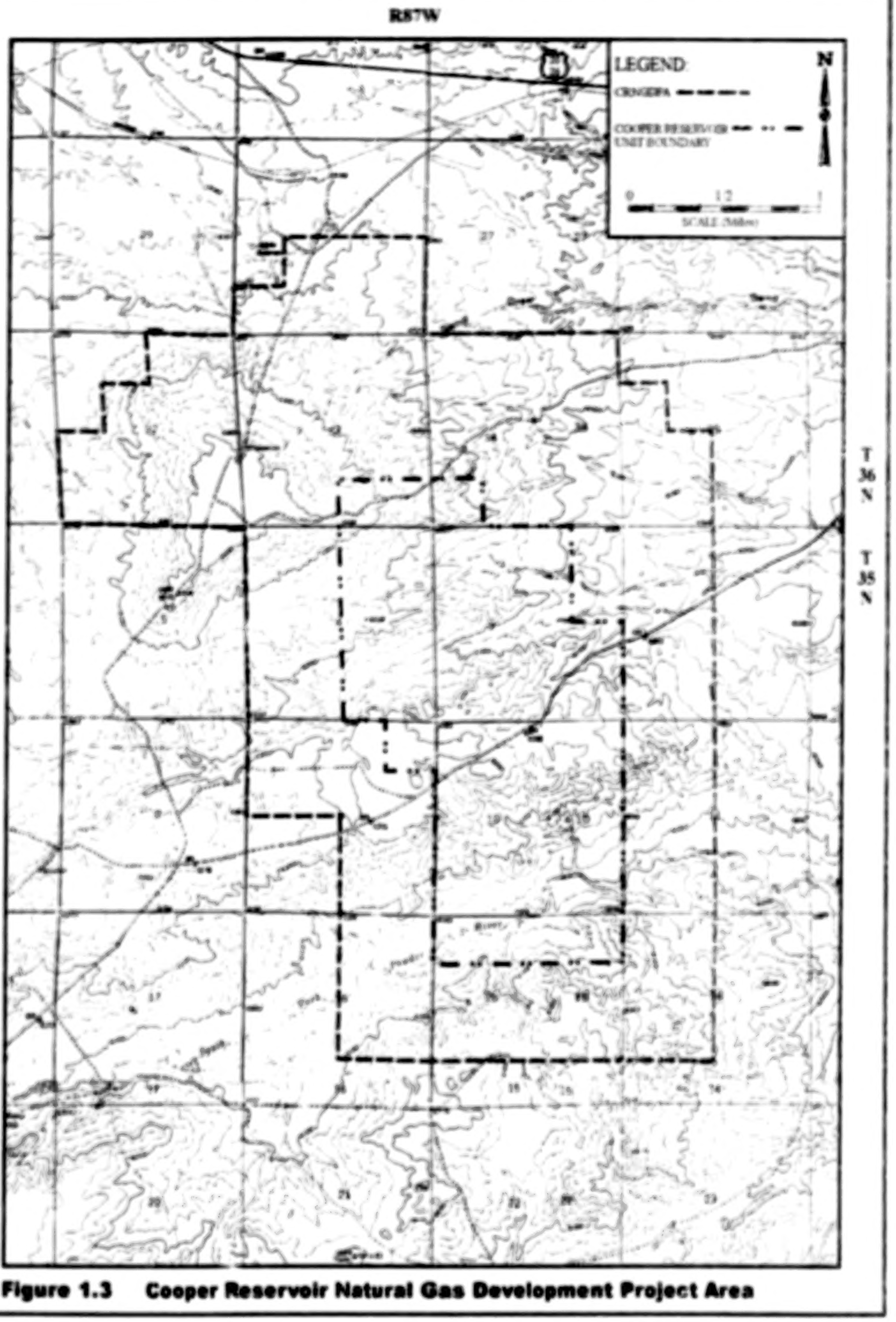

Figure 1.3 **Cooper Reservoir Natural Gas Development Project Area**

The development of federal oil and gas leases is an integral part of the BLM oil and gas leasing program under the authority of the *Mineral Leasing Act* (MLA) of 1920 as amended (30 U.S.C. 181, *et seq*), the *Federal Land Policy and Management Act* (FLPMA) of 1976 (P.L. 94-579), the *Federal Onshore Oil and Gas Royalty Management Act* (FOOGRMA) of 1982 (30 U.S.C. 1701, *et seq*), and the *Federal Onshore Oil and Gas Leasing Reform Act* (FOOGLRA) of 1987 (43 CFR Part 3100). The BLM's oil and gas leasing program is intended to encourage the development of domestic oil and gas reserves, thereby reducing national dependence upon foreign energy supplies.

1.3 NEPA COMPLIANCE

This Environmental Assessment was prepared pursuant to:

- the *National Environmental Policy Act* (NEPA) of 1969, as amended;
- subsequent regulations adopted by the Council on Environmental Quality (CEQ) found in 40 CFR Part 1500-1508; and
- applicable Bureau of Land Management rules, regulations, and policies regarding implementation of NEPA and compliance with CEQ regulations.

This EA was prepared under a third-party contract with the guidance, participation and independent evaluation of the Bureau of Land Management, who is in agreement with the findings of this analysis, and who hereby approves and takes responsibility for the scope and content herein. This EA is intended to be a public document which analyzes the probable and known impacts upon components of the human environment which would result from implementation of the Proposed Action and alternatives, and reaches a conclusion regarding the magnitude of the impact(s). Furthermore, this EA was designed to provide the BLM with both documented evidence and a level of analysis sufficient to allow a determination of whether:

- the impacts from the Proposed Action (or project alternatives) on the human environment are significant, thereby triggering the preparation of an Environmental Impact Statement (EIS); or
- that a *Finding of No Significant Impact* (FONSI) is warranted.

If the BLM determines that impacts are insignificant, a *Finding of No Significant Impact* (FONSI) and *Decision Record* (DR) would be prepared and Intoil would then be allowed to proceed with development in the CRU and adjacent areas identified within this document. If, however, the BLM determines that impacts are significant, the agency would then be required to prepare an EIS.

This environmental assessment is not a decision document. It merely provides documentation of the process used to analyze the impacts of the Proposed Action and project alternatives, if any, on the human environment. Decisions regarding implementation of the Proposed Action or project alternatives will be fully documented in a *Decision Record* which will be issued by the BLM and will apply only to those lands and resources for which they have been granted specific management responsibility.

Various additional aspects of the environment are regulated by other federal, state, and/or local agencies and this EA is not intended to eliminate the need for Intoil to pursue permit approval(s) from these regulatory authorities. To the contrary, this document is also designed to provide these agencies with the information necessary to assist them in arriving at their own independent decisions regarding the issuance of permits and approvals necessary for Intoil to proceed with the Proposed Action. In this regard, it is essential that these additional regulatory authorities carefully review this EA to ensure that impacts not under the authority of the BLM are disclosed and that possible mitigation measures are identified.

This EA considers direct, indirect, and cumulative impacts of the Proposed Action and the No Action Alternative. As stated above, the purpose of this analysis is to provide the decision-makers with information needed to make a final decision that is fully informed and based upon factors relevant to the proposal. It also serves as the summary documentation of analyses conducted on the proposal in order to identify environmental impacts and those mitigation measures which may be necessary to address issues. Analyses in the EA are restricted to the potential environmental impacts associated with additional development of the federal leases in the CRNGDPA including the effects of access road and drill pad construction, additional drilling activities, production testing, produced water disposal, site abandonment and subsequent reclamation. These analyses include the direct effects of construction and drilling activities at or near the proposed drill sites and along the access road corridors, the indirect environmental effects likely expected within a larger study area surrounding each individual drill site and access road corridor, as well as the cumulative impacts of the *Proposed Action* upon the human environment. Additionally, this environmental analysis will include:

- a determination as to whether the Proposed Action is in conformance with BLM policies, regulations, and approved land management direction pertaining to oil and gas exploration and development activities;

- a determination as to whether the Proposed Action is compatible with other resources and permitted land uses in the analysis area; and

- a determination as to whether locations exist for the proposed facilities that would be environmentally suitable, meet the needs of other resource management activities, and which acceptably mitigate surface resource impacts, while honoring the leaseholder's rights.

In compliance with NEPA and CEQ regulations, this EA also considers impacts associated with implementation of the No Action Alternative which would result from BLM denial of the individual permits and/or approvals necessary to develop those federal mineral leases included within the area of analysis. Although a decision to select the No Action Alternative for the CRNGDPA is available to the BLM through denial of any (or all) of the individual Applications for Permit to Drill, the right to drill and/or develop somewhere within the leasehold cannot be denied by the Secretary of Interior (see Section 2.4). Authority to completely deny can only be granted by Congress (*Union Oil Company of California vs. Morton*, 512 F. 2nd 743, 750-751; *9th* Cir. 1975).

This Environmental Assessment contains six (6) primary chapters, described below, and various appendices which are directly relevant to this analysis document. These six primary chapters are described as follows.

- Chapter One, Purpose Of and Need For Action: Provides an introduction and discusses the proposal's compliance with applicable Federal, State and local laws, regulations and land use plans. The discussion of agency regulatory authority and responsibility is important because in some cases (i.e., emissions, discharge of pollutants, off-site waste disposal, etc.) direct authority to regulate impacts from the Proposed Action or project alternatives is vested with agencies other than the BLM.

- Chapter Two, Proposed Action and Alternatives: Provides a detailed description of both the Proposed Action and alternatives as analyzed in this EA.

- Chapter Three, Affected Environment: Provides a description of the environment in the project area as it currently exists.

- Chapter Four, Environmental Consequences: Describes the impacts associated with each alternative including the Proposed Action. Where appropriate, mitigation measures are identified to reduce impacts to an acceptable level. In some cases these mitigation measures may be outside of the regulatory authority vested with the BLM, but may be under another agency's authority, or can be implemented voluntarily by Intoil.

- Chapter Five, Mitigation and Monitoring: Summarizes the mitigation measures identified to eliminate or minimize impacts associated with the Proposed Action and alternatives.

- Chapter Six, Consultation and Coordination: Provides a summary of those issues identified during both internal and public scoping during the preparation of this EA. This chapter also provides a list of the EA preparers, reviewers and persons who commented or provided data used in the preparation of the document.

1.4 GENERAL LOCATION AND LAND OWNERSHIP

The CRNGDPA is located approximately 50 miles west of Casper, Wyoming in Natrona County within Townships 35 and 36 North, Range 87 West as shown on Figure 1.1. Access to the project area is provided by the two-lane paved U.S. Highway 20-26 west from Casper to the community of Waltman, thence south/southwest approximately 5.5 miles on Natrona County Road #212. The project area encompasses 6,282.38 acres of mixed federal, state, and private lands. Of this total, 2,640.28 acres are owned by the United States of America, 1,000 acres are owned by the State of Wyoming, and the remaining 2,642.10 acres are owned by private individuals. Table 1.1 summarizes surface ownership within the overall project area. Mineral ownership is summarized in Table 1.2.

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Table 1.1

Surface Ownership in the Project Area

Surface Ownership	Acres	Percent of Total
Federal (BLM)	2,640.28	42.0
Private (Fee)	2,642.10	42.1
State of Wyoming (State)	1,000.00	15.9
Total	**6,282.38**	**100.0**

Table 1.2

Mineral Ownership in the Project Area

Mineral Ownership	Acres	Percent of Total
Federal (BLM)	4,639.95	73.9
State of Wyoming (State)	1,000.00	15.9
Private (Fee)	642.43	10.2
Total	**6,282.38**	**100.0**

Figure 1.4 shows the surface ownership of those lands included within the CRNGDPA and Figure 1.5 shows the mineral ownership of those lands.

1.5 AUTHORIZING ACTIONS AND RELATIONSHIP TO STATUTES AND REGULATIONS, OR OTHER PLANS

Several regulatory agencies have jurisdiction over the Proposed Action or project alternatives and, in some cases, the regulatory authority vested with these various agencies overlaps. Those federal agencies with direct regulatory authority over the Proposed Action and project alternatives include:

- The Bureau of Land Management (BLM), which is responsible for approval of construction, drilling and reclamation activities on federal surface and/or mineral estate within the overall project area.

- The U.S. Fish & Wildlife Service (USFWS), which has responsibility for minimizing impacts to listed endangered and/or threatened species, those species proposed for listing as either threatened or endangered, and their critical habitats.

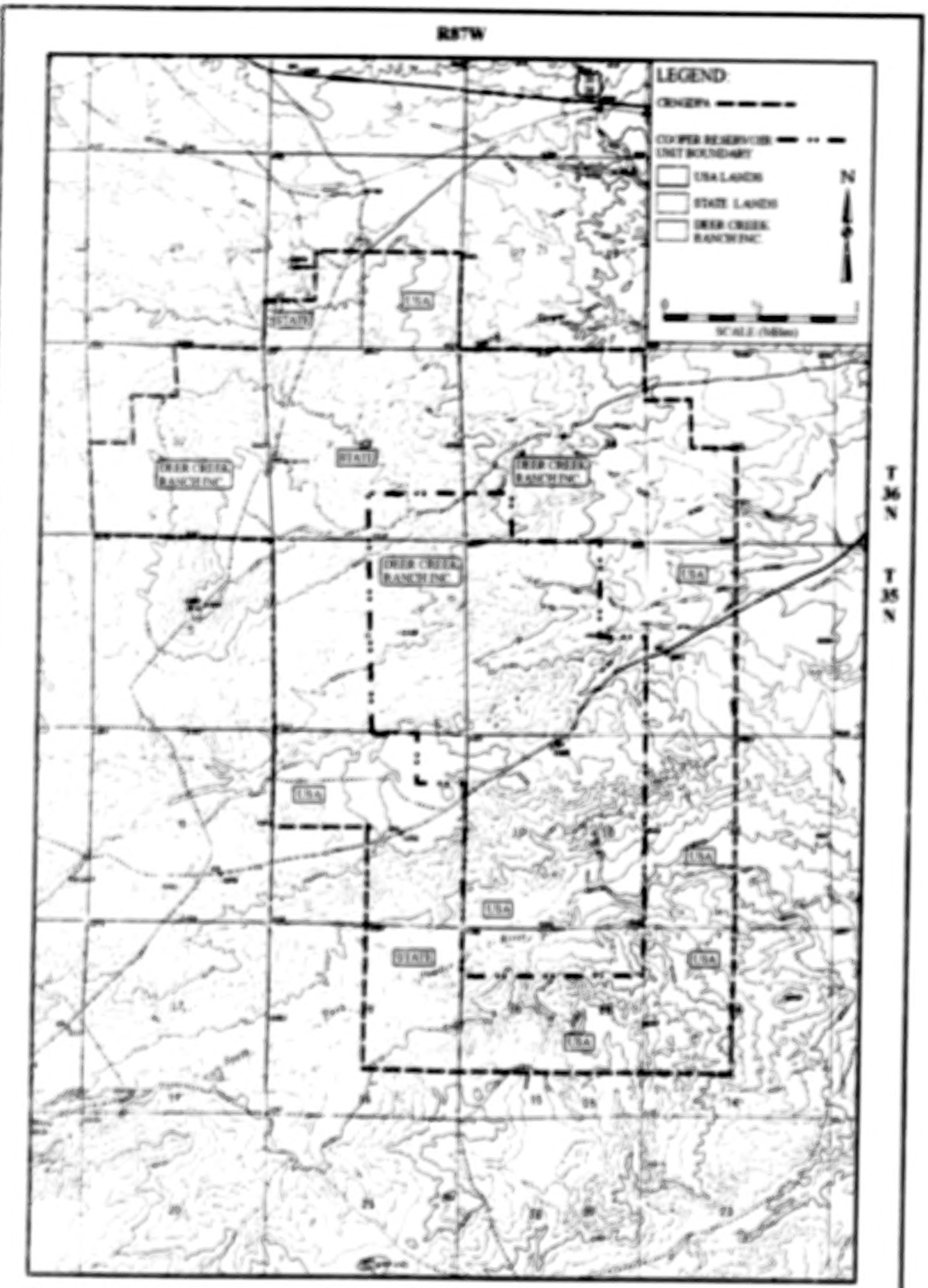

Figure 1.4 Surface Ownership in the CRNGDPA

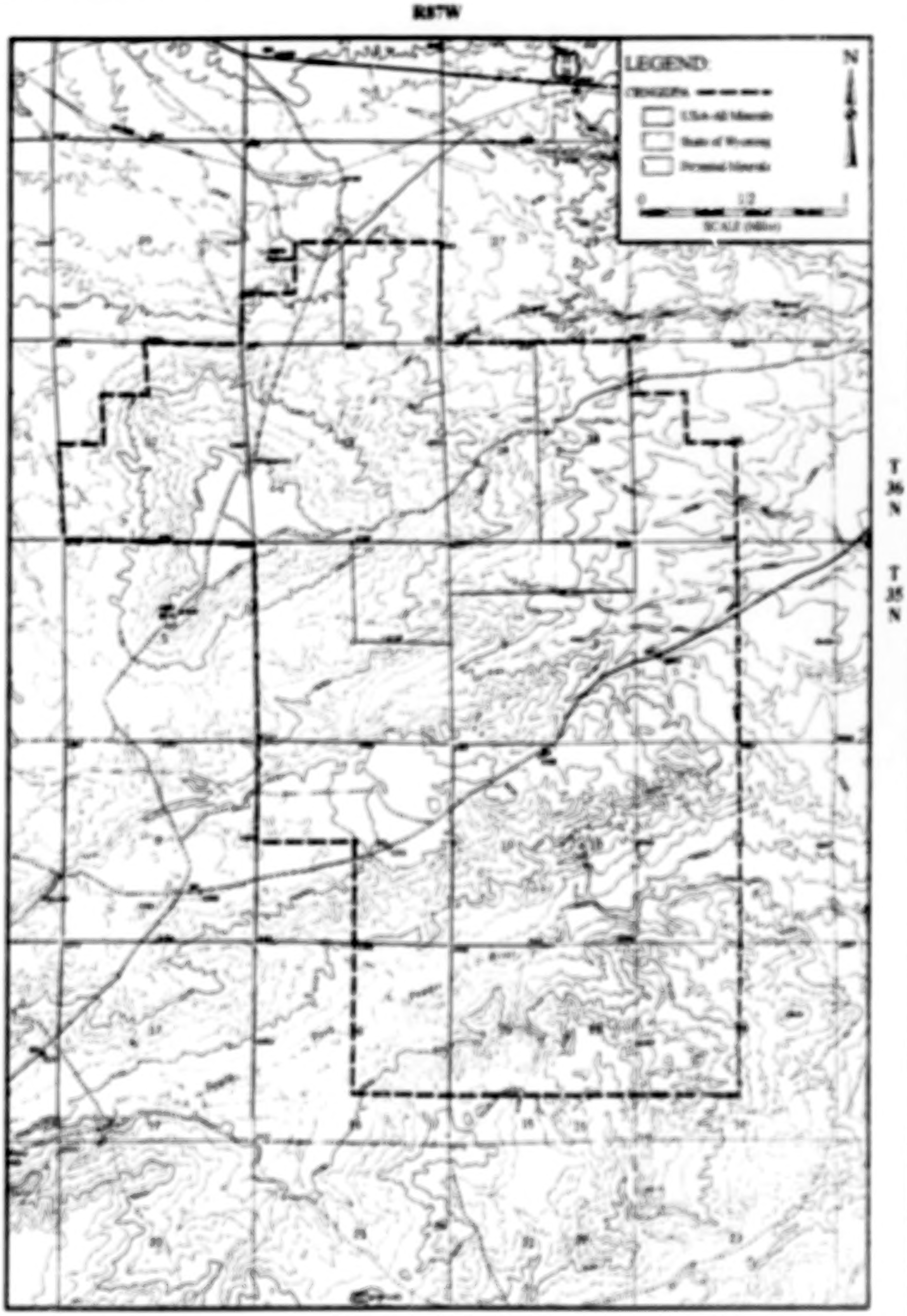

Figure 1.5 Mineral Ownership in the CRNGDPA

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Primary state regulatory oversight for oil/gas well drilling activity is vested with the Wyoming Oil and Gas Conservation Commission (WOGCC), while the Wyoming Department of Environmental Quality (WDEQ) regulates the off-site disposal of drilling related wastes. These requirements are an integral part of the approval process for the Proposed Action or project alternatives and generally establish minimum criteria for approval of operations on federal lands. A discussion of the primary federal and state permitting requirements for project activities is presented below. Tables 1.3, 1.4, and 1.5 present a brief synopsis of all potentially applicable permit requirements for those federal, state, and local agencies which may have jurisdiction over some aspect of the Proposed Action.

1.5.1 Primary Federal Permitting Requirements

The development of federal oil and gas leases is an integral part of the Bureau of Land Management's oil and gas leasing program under the authority of the *Mineral Leasing Act* of 1920, as amended, the *Federal Land Policy and Management Act* of 1976, as amended, and the *Federal Onshore Oil and Gas Leasing Reform Act* of 1987. These acts require the Bureau of Land Management (BLM) regulate all surface disturbing activities on surface or mineral estate owned by the United States of America and managed under the jurisdiction of the BLM [30 U.S.C. 226 (g)]. The BLM is responsible for ensuring that development activities are conducted in a manner that minimizes conflicts with other uses and damage to surface resources.

1.5.1.1 Bureau of Land Management

Federal surface and mineral estate located within the CRNGDPA is administered by the BLM's Platte River Resource Area office. Approval of surface disturbing activities associated with additional oil/gas exploration and development activity within the CRNGDPA by the PRRA would fall under the regulations found at 43 CFR Part 2800 for authorization of those activities proposed on federal land by third parties, and on off-lease federal lands by the Operator and at 43 CFR Part 3160 for authorization of those activities proposed on lease regardless of surface ownership. Guidelines have been established for exploration and development operations on onshore federal oil and gas leases in a series of Onshore Oil and Gas Orders which are authorized under 43 CFR Part 3160. These orders detail uniform national standards for minimum levels of performance expected from lessees and operators when conducting oil and gas related activities on federal and Indian lands. Two (2) of these orders are particularly relevant to the Proposed Action or project alternatives and are discussed below.

1.5.1.1.1 Onshore Oil & Gas Order Number 1

Onshore Oil & Gas Order (OOGO) Number 1 requires lessees and operators to conduct their construction, exploration, development and production operations in a manner which:

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TABLE 1.3

PERMITS, APPROVALS AND AUTHORIZING ACTIONS NECESSARY FOR ADDITIONAL EXPLORATION AND DEVELOPMENT ON FEDERAL LANDS IN THE COOPER RESERVOIR NATURAL GAS DEVELOPMENT PROJECT AREA

A. DEPARTMENT OF THE INTERIOR

Agency	Nature of Action
1. **Bureau of Land Management**	
a. Platte River Resource Area	Approval of APD and Sundry Notices for actions on federal surface and/or mineral estate.
	Approval to vent or flare gas during testing.
	Approval to dispose of produced water.
	Right-of-Way Grants for off-lease/unit facilities.
	Right-of-Way Grants to third party applicants for facilities both in and out of the lease/unit.
	Review cultural resource inventories, consult with SHPO and ACHP.
b. Wyoming Reservoir Management Group	Approval of Unit Agreement and annual Unit Plan of Development.
2. U.S. Fish & Wildlife Service	Review impacts to federally listed, or proposed for listing, threatened or endangered species of fish, wildlife and plants.
	Administers the *Migratory Bird Treaty Act*.

B. DEPARTMENT OF THE ARMY

Agency	Nature of Action
1. U.S. Army Corps of Engineers	Issue permits for the placement of dredged or fill material in or excavation of waters of the U.S. and their adjacent wetlands pursuant to Section 404 of the Clean Water Act.

TABLE 1.4

STATE OF WYOMING PERMITS, APPROVALS AND AUTHORIZING ACTIONS NECESSARY FOR ADDITIONAL EXPLORATION AND DEVELOPMENT IN THE COOPER RESERVOIR NATURAL GAS DEVELOPMENT PROJECT AREA

Agency	Nature of Action
1. Department of Environmental Quality	
a. Air Quality Division	Approval to burn commercial garbage and/or any other open air burning.
	Permitting/approval for compression sites, flaring, and other natural gas production and processing facilities.
	Fugitive dust suppression.
b. Land Quality Division	Approval of off-site solid waste disposal.
	Approval of permits for aggregate material (e.g., sand and gravel) mining activity.
c. Water Quality Division	Approval of Storm Water Pollution Prevention Plan (SWPPP).
	Approval of surface discharge of produced water.
	Approval of waste water and sewage disposal.
2. Department of Transportation	The transport of oversize, overweight or overlength loads (particularly construction and drilling equipment) would require transport permits from the State of Wyoming (for the use of both state and federal highway systems within the State).
3. Oil & Gas Conservation Commission	Primary authority for drilling operations on state and privately owned mineral resources, and secondary authority for drilling operations on federal lands.
	Authority to allow or prohibit flaring or venting of gas on private or state owned minerals.
	Aquifer exemption permit.
	Approval of directional drilling operations.
	Rules and regulations governing drilling units.
	Underground Injection Control (UIC) permits.

TABLE 1.4 - Continued

STATE OF WYOMING PERMITS, APPROVALS AND AUTHORIZING ACTIONS NECESSARY FOR ADDITIONAL EXPLORATION AND DEVELOPMENT IN THE COOPER RESERVOIR NATURAL GAS DEVELOPMENT PROJECT AREA

Agency	Nature of Action
3. Oil & Gas Conservation Commission	Approval of exceptions to well spacing patterns established under WOGCC Rule 302 or special orders approved by the commission.
4. State Engineer's Office	Issue permits for the appropriation of surface and ground water.
5. State Historic Preservation Office	Consultation concerning inventory of, and impacts to, cultural and historical resources.

TABLE 1.5

NATRONA COUNTY PERMITS, APPROVALS AND AUTHORIZING ACTIONS NECESSARY FOR ADDITIONAL EXPLORATION AND DEVELOPMENT IN THE COOPER RESERVOIR NATURAL GAS DEVELOPMENT PROJECT AREA

Agency	Nature of Action
1. Health Department	Small wastewater (septic) system permits, where applicable.
2. Planning Department	Administers zoning changes, where applicable.
	Construction and conditional use permits for all new structures and non-mineral mining activity (aggregate material) where appropriate.
3. Road and Bridge Department	Driveway access permits where new roads intersect with existing county roads.
	Road use agreements and/or oversize trip permits when traffic on county roads exceeds established size/weight limitations or where the potential for excessive road damage exists.

1) conforms with applicable Federal laws and regulations and with State and local laws and regulations to the extent that such state and local laws are applicable to operations on federal or Indian leases;

2) conforms with the terms of the mineral lease;

3) results in diligent development and efficient resource recovery;

4) protects the lease from drainage;

5) affords adequate safeguards for the environment;

6) results in the proper reclamation of disturbed lands;

7) conforms with currently available technology and practice;

8) assures that underground sources of fresh water will not be endangered by any fluid injection; and

9) otherwise assures the protection of the public health and safety.

Furthermore, the order holds the operator "...fully accountable for their contractors' and subcontractors' compliance with the requirements of the approved permit and/or plan". OOGO Number 1 specifically requires survey work and a related report if the responsible Surface Management Agency (SMA) has reason to believe that properties listed, or potentially eligible for listing, on the National Register of Historic Places (NRHP) are present in the area of potential effect. The order also requires the responsible SMA to identify any threatened or endangered species, critical habitat problems, and other environmental concerns (e.g., wilderness and wilderness study areas, wild and scenic rivers, known or potential surface geological hazards, etc.). In compliance with OOGO Number 1, surveys for both cultural resources and threatened and endangered species either have been or will be completed for the Proposed Action and applicable project alternatives (refer to Sections 3.4 and 4.9.3, respectively).

1.5.1.1.2 Onshore Oil & Gas Order Number 2

Onshore Oil & Gas Order (OOGO) Number 2 establishes specific and detailed requirements along with minimum standards for each aspect of the drilling operation including:

1) well control during drilling;

2) casing and cementing;

3) drilling medium and circulating system;

4) drill stem testing;

5) special drilling operations; and

6) procedures for plugging and abandonment.

OOGO Number 2 requires that blowout prevention equipment (BOPE) be installed, used, maintained, and tested in a manner necessary to ensure well control at all times and is designed to prevent the uncontrolled release of formation fluids and/or gases to the surface. The BOPE must be in place and operational prior to drilling out from under the surface casing shoe (unless otherwise approved by the BLM in the site specific conditions of approval) and must be capable of complete closure of the well bore should an emergency arise. In some instances, OOGO Number 2 relies on existing standards prepared by the American Petroleum Institute (API), Occupational Safety and Health Administration (OSHA) and other agencies as applicable.

1.5.1.2 U.S. Fish and Wildlife Service

Any area that provides critical habitat for federally-listed and/or candidate (proposed for listing) threatened or endangered species and that may be potentially affected by surface-disturbing activities is protected by the *Endangered Species Act* (ESA) of 1969, as amended. The ESA obligates Federal agencies to ensure that actions which they authorize or permit "...are not likely to jeopardize the continued existence of any endangered species..." [42 U.S.C. 1536(a)(2)], with the term "jeopardize" defined by the U.S. Fish & Wildlife Service as follows:

> "to engage in any activity or program which reasonably would be expected to reduce the reproduction, number or distribution of a listed species to such an extent as to appreciably reduce the likelihood of the survival and recovery of that species in the wild" (50 CFR 420.02).

The ESA is designed to protect threatened or endangered species in two (2) primary ways:

1) by prohibiting the jeopardizing of their continued existence, and

2) by indirectly prohibiting the adverse modification of their habitat.

The permitting agency (BLM) is responsible for determining if any threatened, endangered or candidate species may be present in the project area, and is prohibited from authorizing or permitting any activities which would jeopardize the continued existence of any T/E species identified within the project area.

1.5.2 Primary State Permitting Requirements

In addition to the federal permitting requirements discussed in Section 1.5.1, additional permits would also be required from agencies of the State of Wyoming (refer to Table 1.4). A description of these responsible state agencies and their applicable permit requirements are presented below.

1.5.2.1 Wyoming Department of Transportation

The transport of oversize, overweight or overlength loads (particularly construction and drilling equipment) would require transport permits from the State of Wyoming (for the use of both state and federal highway systems within the State).

1.5.2.2 Wyoming Oil & Gas Conservation Commission

Pursuant to Wyoming Statute 30-5-101 *et seq*, the Wyoming Oil & Gas Conservation Commission (WOGCC) has adopted rules and regulations for the production and conservation of oil and gas as well as rules of practice and procedure pertaining thereto. As a result, Intoil must secure approval from the WOGCC for drilling operations on each of the 73 additional wells proposed herein, in addition to the federal APD approval process where applicable.

The permitting process and informational requirements are similar to the federal APD process and apply to all patented, state and federal lands within the State of Wyoming, with the exception of tribal lands located within the Wind River Indian Reservation. Following is a summary of those WOGCC rules and regulations which are applicable to the Proposed Action or project alternatives.

- *Rule 302* - Location of Wells. Establishes minimum spacing patterns (well densities) within the State of Wyoming.
- *Rule 308* - Application for Permit to Drill or Deepen a Well. Requires oil/gas operators to file an APD with the WOGCC and obtain approval therefrom prior to the commencement of drilling activities within the State.
- *Rule 318* - Establishes minimum criteria for plugging operations on abandoned oil/gas wells.
- *Rule 322* - General Drilling Rules. Establishes the minimum downhole design criteria applicable to all oil/gas drilling operations.
- *Rule 323* - Blowout Preventers. Establishes the minimum criteria for well control during all drilling operations.

- *Rule 401* - Pollution and Surface Damage. Regulates the construction of earthen reserve and/or water retention pits, surface and subsurface disposal of drilling fluids and generally prohibits the pollution of streams, underground water, or unreasonable damage to the surface of the leased premises or other lands.

The rules and regulations adopted by the WOGCC are similar to the oil/gas operational regulations (Onshore Oil and Gas Orders) adopted and enforced by the BLM (refer to Section 1.5.1.1), and with which the Proposed Action or project alternatives must comply.

1.5.2.3 Wyoming Department of Environmental Quality

The Wyoming Department of Environmental Quality issues permits for and regulates the off-lease disposal of oil/gas related fluids and solids generated during drilling, completion, and production operations. Any fluids and/or solid wastes generated during the drilling operation and subsequently removed from the well location for disposal would require an approved permit from the WDEQ, should disposal occur off-lease or in a previously unapproved location.

The Wyoming Department of Environmental Quality/Air Quality Division (WDEQ/AQD) also requires a specific air quality pre-construction permit review in order to examine emissions from proposed pollutant sources prior to their construction (i.e., compressor engines or gas plants, etc.). WDEQ/AQD would examine project specific air pollutant emission and potential air quality effects, per requirements of both Wyoming and Federal air quality standards and regulations, and determine which facilities must obtain air pollutant emission permits. For example, individual well sites could be permitted following a limited start-up period, as required by the WDEQ/AQD. Thus as development occurs, site specific air quality analysis would be performed and emission control measures may be required in order to ensure protection of air quality resources.

1.5.2.4 Wyoming State Engineer

The Office of the Wyoming State Engineer issues temporary permits authorizing the appropriation of both unallocated surface water and/or ground water for use in drilling operations pursuant to WS 41-3-110. These temporary appropriation permits are restricted to:

- a specific diversion point,

- a specific point and type of use,

- a specific quantity of unappropriated water, and

- a specific time frame for the total appropriation.

Moreover, these temporary appropriation permits are contingent upon the availability of unappropriated water(s) being present in the designated stream or aquifer at the time of the requested diversion.

1.6 CONFORMANCE WITH EXISTING LAND MANAGEMENT PLANS

The Cooper Reservoir Natural Gas Development Project, as proposed by Intoil, would be consistent with management direction contained in the Platte River Resource Area *Resource Management Plan* dated July 1985. Furthermore, all operations proposed by Intoil would be conducted in full compliance with the terms and conditions of the federal leases involved in the Proposed Action or project alternatives, applicable Onshore Oil and Gas Orders, 43 CFR Part 2800 regarding right-of-way grants, and also with oil and gas leasing regulations as contained in 43 CFR Part 3100, specifically with subpart 3162 concerning Requirements for Operating Rights, Owners and Operators.

The Proposed Action and alternatives are not inconsistent with state and local government programs, plans, zoning, and applicable regulations.

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 INTRODUCTION

Intoil, Inc. (hereinafter referred to as the "Operator") has proposed to drill and develop up to a maximum of 73 additional natural gas wells in the Cooper Reservoir Unit (CRU) and adjacent areas, over a five (5) to ten (10) year period. This proposal would allow for the continued development of natural gas reserves within the CRU and would also provide Intoil with the opportunity to expand the current boundaries of the Cooper Reservoir Natural Gas Field through additional exploration on leases directly adjacent to the CRU. The precise number of wells ultimately drilled, exact locations of the proposed drill sites, and timing of drilling activities would be dictated by:

- the continued success of exploratory or "step-out" wells drilled in the fringe areas surrounding (abutting) the existing CRU, and

- future economic considerations including natural gas prices at the well head compared with the cost(s) to develop, what may prove to be, marginal properties on the fringes of the heretofore known geologic structure (KGS) within the CRU.

Should attempts by Intoil and other mineral interest owners to develop the fringe areas surrounding the CRU not be totally successful, then the level of drilling and production activity in these fringe areas, as described below, would be at a reduced level. Based upon this information, this environmental assessment (EA) addresses both the Proposed Action and the No Action alternatives.

- Proposed Action. This alternative would allow the Operator and/or other mineral interest owners to drill/develop up to 73 additional wells and install related production (ancillary) facilities within the Cooper Reservoir Natural Gas Development Project Area (CRNGDPA).

- No Action Alternative. This alternative implies that both ongoing and previously approved natural gas exploration, development, and production activities would be allowed to continue by the Bureau of Land Management (BLM) in the overall project area, but additional development of leases in the CRU and adjacent areas as currently proposed would be disallowed. Future Applications for Permit to Drill (APD's) and Right-of-Way (ROW) applications would be evaluated by the BLM on a case-by-case basis through site specific environmental analyses in accordance with management direction contained in the RMP for the Platte River Resource Area.

Infill wells drilled on established spacing patterns (e.g., either 40 or 80 acres) within the existing CRU would be classified as development wells, while those "step-out" wells drilled on a 160 acre spacing pattern on the fringes of the CRU and on leases outside of but adjacent to the CRU would be classified as exploration wells.

2.2 PROPOSED ACTION

The proposed action entails additional exploration for and development of natural gas resources within:

1) the Cooper Reservoir Unit;

2) adjacent leases to the north and west of the CRU boundary in which Intoil either has, or is attempting to acquire, an interest therein; and

3) within a one-half (1/2) mile buffer zone around the southern and eastern sides of the CRU (see Figures 1.2 and 1.3) encompassing acreage in which the Operator currently has no interest.

These proposed exploration and development activities would commence in the spring of 1998 and would continue over a period of approximately 10 years, with the productive life of wells drilled in the CRNDGPA estimated to be in excess 20 years. Well spacing patterns would vary across the project area and would typically range from a maximum of 160 acres/well (4 wells per section) for exploratory (wildcat) wells drilled in untested (fringe) areas both within and adjacent to the CRU, to a maximum of 40 acres/well (16 wells per section) for development wells drilled in those areas which prove to be commercially productive either as a result of previous or future drilling efforts. Various associated facilities (e.g., roads, pipelines, water wells, compressor stations, etc.) would also be constructed in conjunction with development of the natural gas resource in the project area.

The proposed exploration/development program would be designed primarily to test the productive potential of the Lower Fort Union/Lance (LFU/L) undifferentiated and Lance Formation(s) to a maximum depth of approximately 11,500 feet. Deeper formations such as the Mesaverde, Frontier, and Dakota may be evaluated at selected locations within the CRNGDPA at some future date; however, the Operator currently has no firm plans for the evaluation of these deeper formations.

Upon completion of drilling operations, these formations would be evaluated and a decision made as to the productive potential of both the LFU/L undifferentiated and/or Lance Formations. In most cases, initial well completion operations would first focus an attempt to establish commercial production from the deeper geologic horizons of the LFU/L undifferentiated Formations. In those cases where these deeper formations were deemed to be non-productive, the Operator would then proceed with completion operations on the shallower geologic horizon(s) of the LFU/L undifferentiated Formations (as warranted) in an attempt to establish production therefrom. However, in those cases where commercial production was initially established from the deeper geologic horizons of the LFU/L undifferentiated Formations and the initial evaluation of the shallower geologic horizons proved promising, a second (or twin) well would be drilled on the existing well pad and completed in an attempt to establish commercial production from the shallower geologic horizons of the LFU/L undifferentiated Formations.

The proposed action would result in approximately 200.75 acres (2.75 acres/well) of new surface disturbance resulting from the construction of additional well locations (including on-site gathering, measurement, and dehydration facilities); 30.42 miles (147.48 acres) of new road construction, reconstruction of approximately 3.97 miles of existing oilfield road to a higher standard (1.92 acres), 30.42 miles (147.48 acres) resulting from the construction of new pipeline rights-of-way; and approximately 10 acres of new surface disturbance resulting from the installation of ancillary facilities (e.g., enlargement of the existing compressor station, centralized tank battery, power lines, water wells, etc.). Total new short-term and life of project (LOP) surface disturbance resulting from the Proposed Action would be 507.61 acres and 287.25 acres, respectively (see Sections 2.2.3 and 2.2.4).

2.2.1 Project Schedule

Completion operations are currently underway in the CRU on well locations which were previously approved by the Platte River Resource Area Office, Bureau of Land Management (USDI-BLM 1996) and subsequently drilled during the 1996 and 1997 drilling seasons. Upon completion of the 1997 drilling season, the Operator had drilled a total of 9 additional wells within the CRU, all of which have been initially completed as producing natural gas wells. An additional 4 NOS's have been submitted to BLM by the Operator for continued drilling operations in the CRU and final approval of these drilling proposals is contingent upon the completion of this analysis document. Drilling operations on these 4 wells will probably commence sometime in the spring/summer of 1998 - these 4 wells are included in the 73 total wells referenced in Section 1.1. Table 2.1 provides a listing of those actions currently pending in the CRNGDPA.

Table 2.1

Currently Proposed Exploration and Development Activity within the CRNGDPA

Operator of Well	Well Name and Number	Legal Location of Proposed Well				Type of Action	Date Filed
		Quarter	Section	Township	Range		
Intoil, Inc.	CRU #15	NW¼SW¼	3	35 North	87 West	NOS	08/26/97
Intoil, Inc.	CRU #16	SW¼NW¼	3	35 North	87 West	NOS	08/26/97
Intoil, Inc.	CRU #17	NW¼SW¼	10	35 North	87 West	NOS	08/26/97
Intoil, Inc.	CRU #18	NW¼SE¼	10	35 North	87 West	NOS	08/26/97
Intoil, Inc.	CRU #19	SE¼SW¼	10	35 North	87 West	Letter	04/13/98
Prima Oil & Gas Co.	Federal #11-23	SW¼NW¼	11	35 North	87 West	NOS	06/18/96

Drilling operations on additional wells within the CRU would commence in the spring/summer of 1998 and would continue over a period of approximately 5 to 10 years or until such time as:

- the total number of proposed wells have been drilled,
- the economic limits of the field have been fully defined, or

- current economic conditions deteriorate to the point that it is no longer economic to drill and complete wells in the project area.

Generally speaking, drilling operations would be expected to occur on a seasonal basis (e.g., late spring, summer, and early fall) utilizing a maximum of two (2) drilling rigs to completely develop the field.

2.2.2 Transportation and Workforce Requirements

Construction and rig crews, materials and equipment would be transported to the project area over U.S. Highway 20/26 and Natrona County Road #212 (Gas Hills Road) (see Figures 1.1 and 1.3). Construction, rig crews, and support personnel typically would be housed in the Casper area, eliminating the need for a man camp or temporary housing within the project area. Other support personnel (e.g., cementing, frac, and/or perforating crews) would also be based out of either Casper or Riverton and housed therein.

2.2.2.1 Transportation Requirements

The Operator would be required to comply with existing Federal, State and County requirements and restrictions developed to protect road networks and the traveling public. Special arrangements would be made with the Wyoming Transportation Department and Natrona County Road and Bridge Department, as required, to transport oversize, overlength, and/or overweight loads to the project area. Otherwise, load limits would be observed at all times to prevent damage to existing road surfaces.

2.2.2.2 Workforce Requirements

Construction Operations. Construction of each individual well location and new access road (if required to tie the proposed well site to the existing road network), would require an average of 4 individual workers for a period of approximately 5 days per well location. These workers would include both heavy equipment operators engaged in construction of the access road and well pad, as well as truck drivers engaged in hauling heavy equipment to and from each respective well location.

Drilling Operations. Typically, rotary drilling rigs employ 4 workers per 12 hour shift, with 2 crews on shift and 2 crews on days off (depending upon the particular drilling contractor selected). In addition, drilling rigs typically employ a drilling foreman who is generally on-site (or on call) 24 hours a day while the rig is drilling. Depending on where the drilling rig is based, these crews would either return to their homes or to local lodging when not on shift. Similarly, these crews would normally return home when on days off. There would be no provision for either permanent or temporary quarters for rig crews within the project area during drilling operations.

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Supervisory and Technical Personnel. Generally, drilling wells require constant attention to the technical aspects of the drilling operation (i.e., geology and engineering). Consequently it is anticipated that a minimum of 4 additional personnel would be on location at various stages during the drilling operation. These personnel would generally include a drilling supervisor/engineer, a geologist, and two mud loggers. In many cases, these individuals are also required to remain on location 24 hours a day once drilling operations commence and trailers would be provided on-location for their use. In addition to company and contractor personnel engaged in supervision of the overall drilling operation, BLM or WOGCC personnel (as applicable) would periodically visit the well location in order to ensure compliance with the approved APD.

Completion Personnel. Completion units typically employ approximately 4 workers per crew, plus a company supervisor. Routine completion operations would only be conducted during daylight hours; consequently, workers would generally seek lodging in the nearest community when not on the job. The Operator has typically utilized well servicing companies which are located in the Casper or Riverton areas; consequently, these workers would return to their individual homes at the end of each work day.

2.2.3 Well Pad Construction

A typical location layout for individual well locations is shown on Figure 2.1. Major components of each individual well pad include:

- a leveled area suitable for placement/support of the drilling rig and related equipment;
- an earthen reserve pit designed to contain drilling fluids, drilled cuttings, and fluids produced during the drilling operation; and
- an earthen flare pit to be utilized for the safe ignition of flammable gases produced during drilling, completion, and testing operations.

The entire well pad area would be cleared of all vegetation and graded to the required specifications prior to moving in the drilling rig and subsequent commencement of actual drilling operations (see Figure 2.1). Prior to grading, the top 6 inches (at a minimum) of topsoil (approximately 1,500 yd^3) would be removed from all areas of cut, fill and/or subsoil storage and stockpiled for future use in reclamation. After the topsoil has been removed, the well pad would be graded to produce a level working platform around the drill hole for support of the rig substructure. The excavated soil material (subsoil) would be utilized in overall pad construction, with the finished well pad graded to allow for positive drainage of natural water (e.g., rain and/or snow melt) away from the drill site. Generally, each individual well location would be designed so that the amount of soil material excavated (less the stockpiled topsoil) should "balance", thereby eliminating the need to store excess subsoil material(s) in large stockpiles adjacent to the well location until site reclamation. Balancing of the excavated soil material would apply to the leveled area of the pad and would not include any materials excavated from the reserve pit below the finished pad grade. Subsoil excavated from the reserve pit would be stockpiled directly adjacent to the reserve pit (see Figure 2.1) and would be utilized to backfill the pit once operations were completed and the pit was reclaimed.

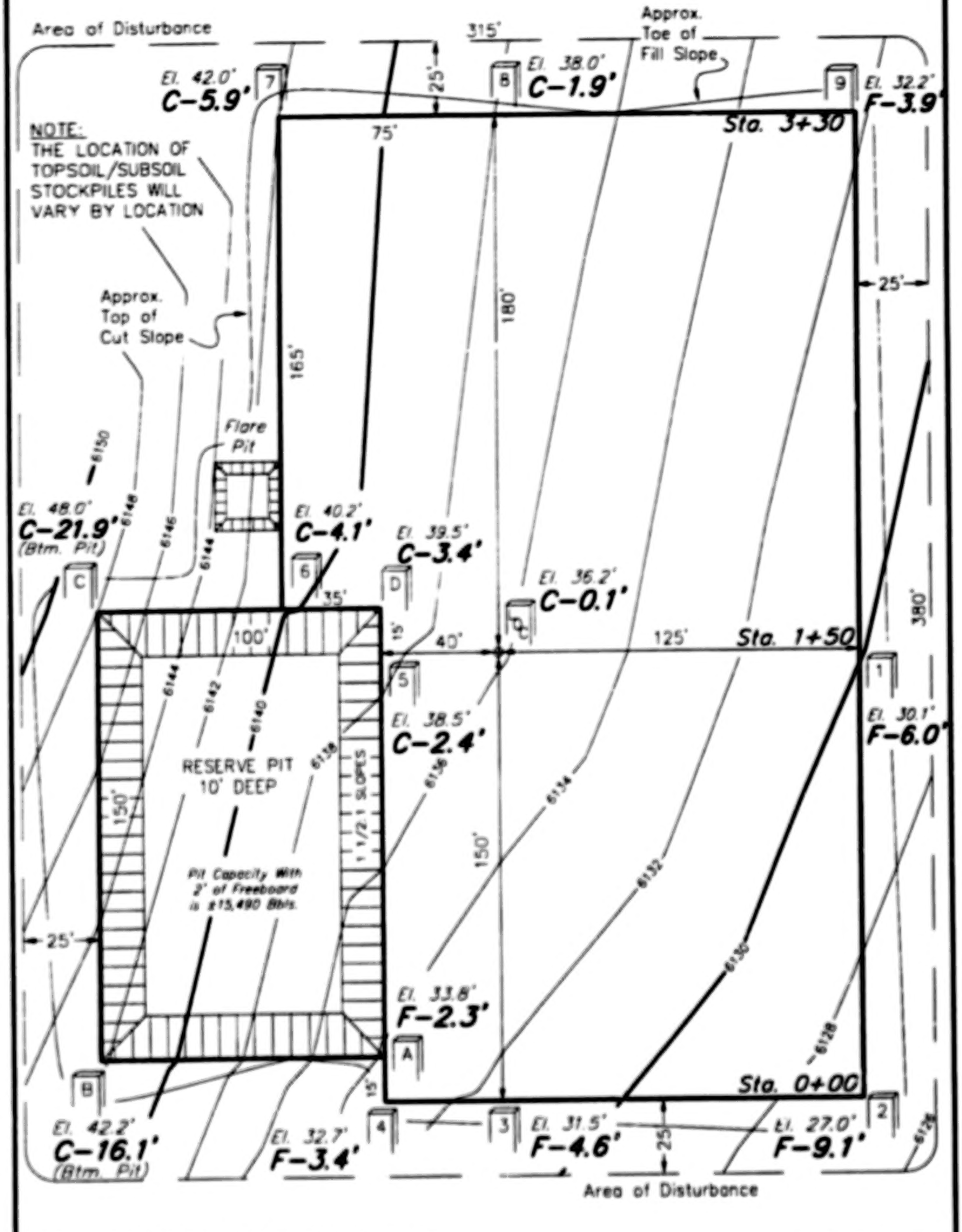


Figure 2.1: Typical Location Layout

SCALE: 1" = 50'

The leveled area required for initial drilling and completion operations for each individual well (well pad) would be approximately 1.73 acres in size (including the reserve pit). In addition, an average of approximately 1.02 acres would generally be required for cut/fill slopes and topsoil/subsoil stockpiles, resulting in approximately 2.75 acres of total surface disturbance per individual well location. Drilling of "twin" wells to shallower geologic horizons of the LFU/L undifferentiated Formations typically would not result in any additional surface disturbance as the "twin" well would utilize the pre-existing well location for operations (refer to Section 2.2.5).

Erosion control would be maintained through prompt revegetation and by constructing surface water drainage controls such as berms, diversion ditches, and sediment ponds as necessary at each well location. Stormwater Pollution Prevention Plans (SWPPP's) would be prepared for all well locations, access roads, and other development sites as required by the State of Wyoming.

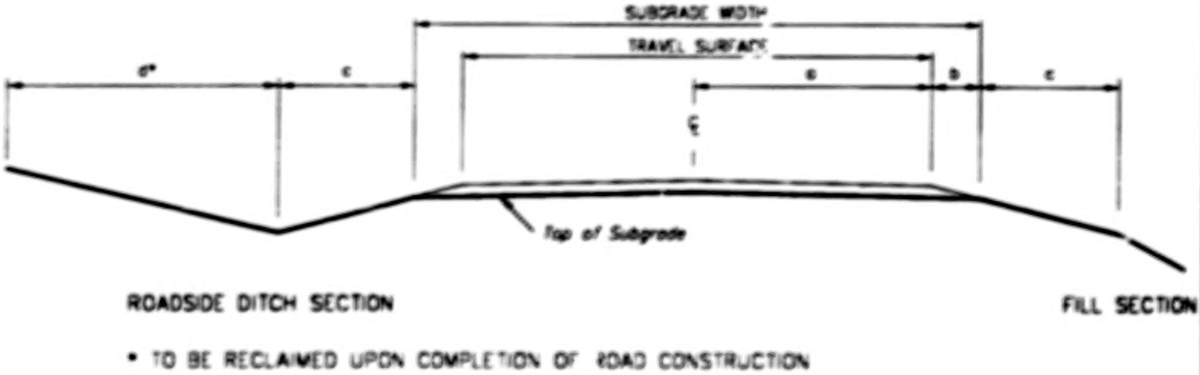
2.2.4 Access Roads

Initial exploration and development activities within the CRU have resulted in the construction of approximately 4.19 miles (22,104 feet) of new (resource) access road. Of this total, approximately 3.97 miles (20,962 feet) would be considered as collector roads for additional exploration and development within the CRNGDPA and would require widening to allow for increased traffic volumes thereon. These roads are currently estimated to be approximately 16 feet in average width and would require widening by 4 feet to achieve a 20 foot running surface (24 foot subgrade). Reconstruction of these existing roads to this higher standard would result in an additional 1.92 acres of new surface disturbance. New road construction associated with additional exploration and development in the project area would generally average approximately 2,200 feet (0.42 miles) of resource road per well location. Considering a total disturbed right-of-way (ROW) width which did not exceed forty (40) feet, this new road construction would result in additional surface disturbance equal to approximately 147.48 acres (or approximately 2.02 acres per well location). As indicated above, no new or expanded access road construction/reconstruction would be required in association with the drilling of "twin" wells to the shallower geologic horizons of the LFU/L undifferentiated Formations. These access roads would be constructed/reconstructed in accordance with roading guidelines established for oil & gas exploration and development activities as referenced in the joint BLM/USFS publication: *Surface Operating Standards for Oil and Gas Exploration and Development*, Third Edition and/or BLM Manual Section 9113 concerning road construction standards on federal lands. Figure 2.2 provides typical guidelines for road construction on projects subject to federal jurisdiction.

2.2.5 Drilling Operations

To facilitate the drilling of these proposed wells, Operators would utilize a minimum of 1 and a maximum of 2 rotary drilling rigs rated for drilling operations to depths of approximately 8,000 feet. Rig transport and on-site assembly would be completed in approximately 4 days, involve approximately 15 people per well location, and require approximately 60 round trips per well location.

TYPICAL CROSS SECTION



* TO BE RECLAIMED UPON COMPLETION OF ROAD CONSTRUCTION

FUNCTIONAL CLASSIFICATION	Minimum Subgrade Width (ft)	Minimum Surfaced Travelway Width (ft)	a (ft)	b (ft)	c (ft)	d (ft)	Approximate Disturbace Width (ft)	Total ROW Width (ft)	Design Speed (mph)
Resource Road	16	12	6	2	4	8	40	50	15-30
Local Road	24	20	10	2	4	8	48	55	20-50
Collector Road	28	24	12	2	4	8	52	60	30-50

DIAGRAM OF TYPICAL TURNOUTS ON RESOURCE ROADS (PLAN VIEW)

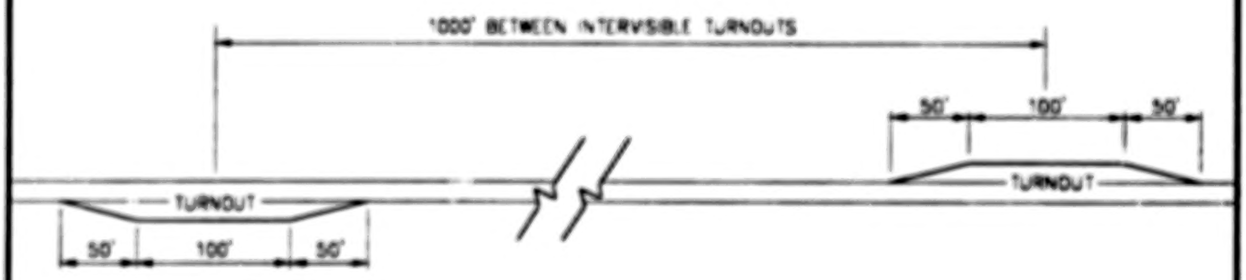


Figure 2.2: Typical Roadway Cross-Section With Width Specifications.

Drilling operations would require approximately 14 days per well location from the time the drilling rig is moved onto the location (move in-rig up) until such time as drilling operations have been completed and the rig is moved off of the location (rig down-move out). Figure 2.3 is a schematic representation of a typical drilling rig layout. Drilling operations on the shallower "twin" wells would utilize a smaller rotary drilling rig than that required for operations on wells drilled to the deeper geologic horizons of the LFU/L undifferentiated Formations. Use of a smaller drilling rig for operations on these "twin" wells would allow the Operator to utilize the existing well pad as originally constructed for secondary drilling operations thereon.

After completion of the drilling phase of operations and prior to rig release, the well would be logged and, if warranted, production casing would be set to total depth and cemented into place. Setting and cementing the production casing string would serve to maintain hole integrity while isolating those formations downhole which could potentially contain either fresh water or hydrocarbons. Proper cementing of the production casing string would eliminate the possibility for fluid communication between hydrocarbon bearing zones and/or near surface fresh water aquifers.

Human waste generated at well locations would be collected in standard portable chemical toilets or service trailers and regularly transported off-site to a state-approved disposal site (e.g., Casper or Riverton wastewater treatment plants). Each well location would be provided with one or more such facilities during drilling and completion operations. A septic system would not be required. Non-human waste would be collected in enclosed containers and disposed of at a state-approved waste disposal facility (e.g., Casper Balefill Facility).

2.2.5.1 Drilling Fluids System

The actual drilling operation would utilize a water-based mud system with additives for lost circulation, hole stabilization, and/or conditioning prior to logging and/or running casing. Basically, this system involves drilling with water and utilizing additives to minimize downhole problems. On the average, the Operator would utilize approximately 1.5 barrels of water (42 gallons/barrel) per foot of hole drilled. This water would be obtained from three (3) primary sources.

- Cooper Reservoir Unit #1 Water Supply Well (WSW) located in the SE¼NW¼ of Section 3, Township 35 North, Range 87 West, Permit #UW-107836. This well produces water at a rate of approximately 25 gallons per minute (gpm), which should be sufficient for a single drilling rig operating in the CRNGDPA.

- Knigge #1 water well owned by Mel's Water Service and located in the NE¼NE¼ of Section 30, Township 36 North, Range 86 West, Permit #UW-107461. This well produces approximately 60 gpm and has an earthen storage pit constructed adjacent thereto.

- UP #1 water well owned by Andy & Glena VanPatten and located in the NE¼SW¼ of Section 30, Township 36 North, Range 86 West, Permit #UW-104817. This well produces approximately 25 gpm and also has an earthen storage pit constructed adjacent thereto.

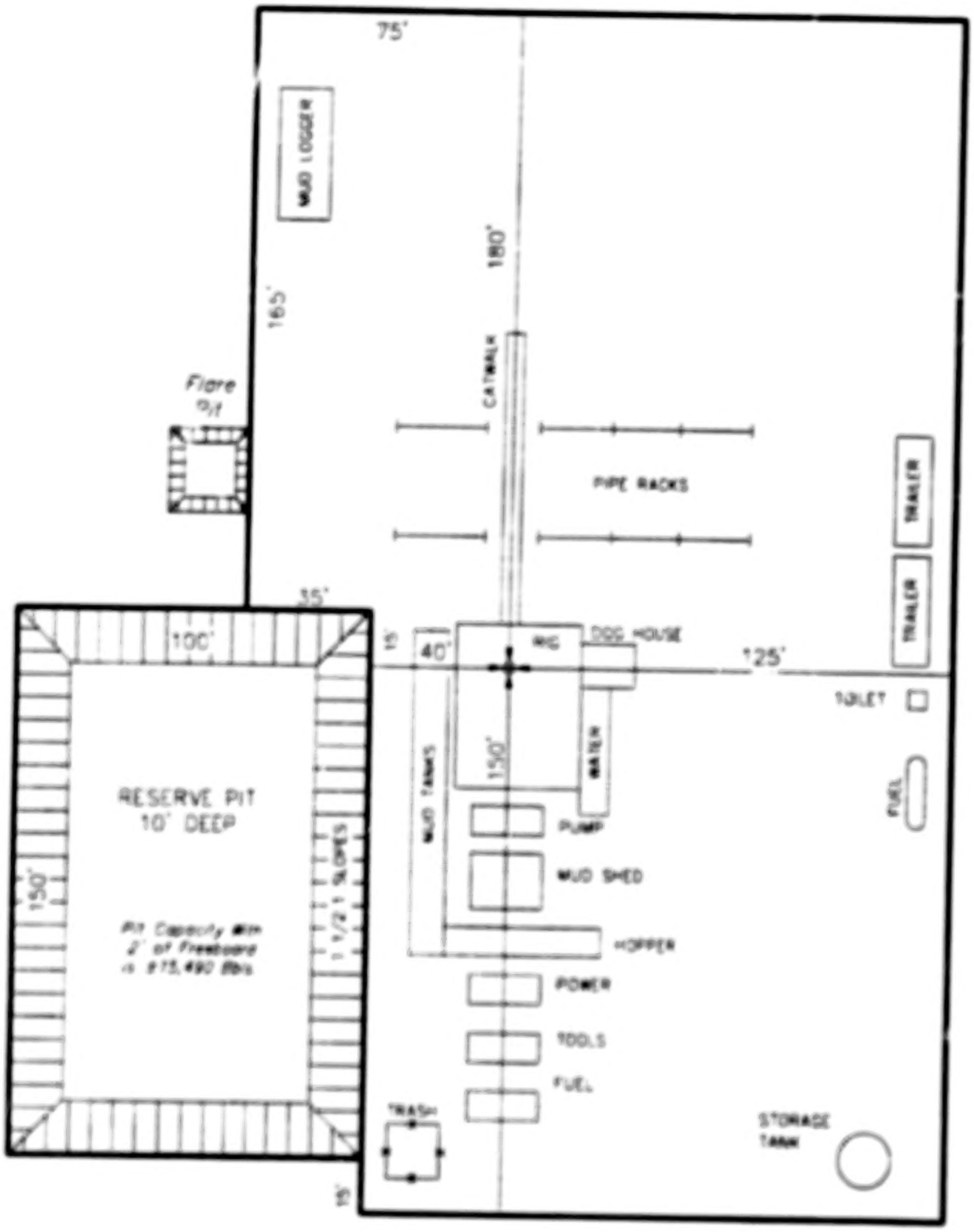


Figure 2.3: Typical Drilling Rig Layout

SCALE: 1" = 50'

Water to be utilized in drilling operations would be contained in a "reserve pit" constructed on each location (refer to Figure 2.1) and would serve as the base medium for the drilling mud system. The reserve pit would be fenced on the three non-working sides during drilling, with the fourth side of the pit fenced immediately following removal of the drilling rig in order to protect wildlife and livestock. Fencing would be installed in accordance with guidelines contained in the joint BLM/USFS publication: *Surface Operating Standards for Oil and Gas Exploration and Development*, Third Edition and would be maintained until the reserve pit has been backfilled. Netting (1 inch mesh) would be placed over reserve pits containing hydrocarbons or other substances toxic to wildlife in compliance with BLM Information Bulletin Number WY-93-054.

The Operator intends to evaluate the potential for use of a "semi-closed" mud system for drilling operations on "twin" wells within the CRNGDPA. Should this drilling method prove successful, fluids would be contained in steel tanks on location and the cuttings would be deposited in the reserve pit constructed in association within initial location construction. In the event that the reserve pit has already been closed (reclaimed), the cuttings would be transported to an existing reserve pit on another location within the CRNGDPA for disposal. Upon completion of drilling operations, the drilling fluids would be removed from the well location and disposed of in strict accordance with applicable state and/or federal rules and regulations pertaining thereto.

2.2.5.2 Casing & Cementing Operations

Surface casing would typically be set to a minimum depth of 700 feet and cemented back to the surface on each proposed well. This would serve to isolate all near surface fresh water aquifers which could occur in the project area. Upon reaching total depth, production casing would be run and cement circulated to a minimum of 300 feet above the top of the shallower geologic horizons of the LFU/L undifferentiated Formations, effectively isolating all geologic formations encountered down hole in compliance with OOGO Number 2. This procedure would eliminate any possibility for fluid communication between potential hydrocarbon bearing zones and any fresh water aquifers which may be encountered downhole.

2.2.6 Completion and Evaluation Operations

Once the well has been drilled and cased, a completion (work-over) unit is moved onto the well location and completion operations are commenced. These completion operations generally require an average of 3 to 5 days per well location, consist of cleaning out the well bore with water containing a 3% solution of potassium chloride (KCl), pressure testing, and perforating the potentially productive formations downhole.

After the casing has been perforated, production tubing is run and the targeted downhole zones of the LFU/L undifferentiated Formations are fractured. A normal "frac" of each potentially productive formation would include a mixture of approximately 1,500 barrels of fresh water (mixed with KCl to obtain an overall 3% solution) and 100,000 to 150,000 pounds of sand which is pumped down the casing under extreme pressure and forced through the perforations into the formation. As the formation is fractured, the resultant fissures (fractures) are filled with sand which props them open and facilitates the flow of gas into the well bore and subsequently to the surface.

Upon completion of the frac job, the well is flowed back to the surface in an attempt to recover as much of the frac fluid as possible and to clean excess sand out of the perforations prior to setting production equipment on location and placing the well on line. All fluids utilized in the completion procedure are captured either in the reserve pit or in test tanks on the well location and ultimately disposed of in strict accordance with Wyoming Department of Environmental Quality (WDEQ) rules and regulations. Gases produced in association with completion and testing are diverted to the flare pit. Approximately 30 days of well testing are typically required to recover frac fluids, clean out the perforations, and obtain an accurate flow test of the well.

2.2.7 Production Operations

As wells are completed, production equipment would be set on the location, natural gas pipelines installed and the well placed "on line" with production continuing so long as the well is capable of commercial production and a demand for the gas exists (peak usage periods traditionally occur in the winter months). The on-site production equipment would typically include the following equipment:

- a christmas tree at the well head (a series of valves designed to control pressures and regulate flows from the well);
- a hydrocarbon production unit (3-phase separator) designed to separate liquids from the natural gas stream;
- a glycol regenerating unit, dehydrating contact tower (dehy) with integral scrubber designed to remove any remaining water from the gas stream prior to sales;
- a 50 psi free water knockout designed to remove water from the condensate stream, as needed;
- two 400 barrel storage tanks, one each for produced water and condensate storage, and
- a meter run for measurement of gas volumes produced into the pipeline.

Figure 2.4 is a typical production facility layout designed for those well locations consisting of a single producing gas well.

In those instances where "twin" producing wells are located on a single well pad and both wells have similar producing characteristics, both producing wells would share production equipment to the greatest extent possible. This shared equipment would generally consist of the storage tanks and glycol dehydrator.

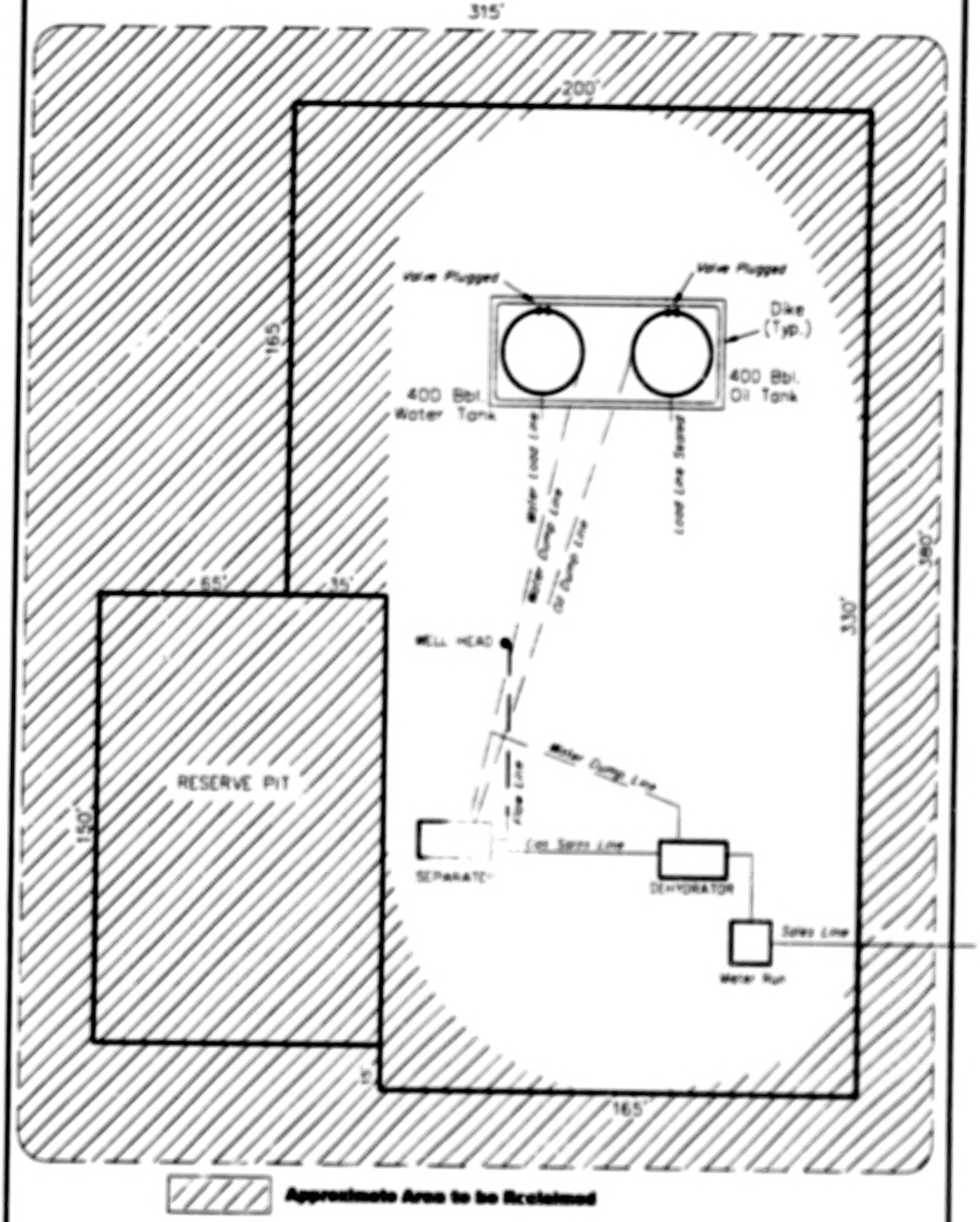


Figure 2.4 Typical Production Facility Layout (Single Well)

SCALE: 1" = 50'

Buried flowlines would route the produced gas stream from the individual well head assemblies to individual 3-phase separators in order to separate fluids (condensate and water) from the gas stream prior to sales. These separated fluids would be routed to the appropriate storage tanks on location and the gas stream would then be routed to the glycol dehydrator for final dehydration and then through a sales meter for gas measurement. The gas stream from the "twin" well would be routed through a separate sales meter prior to entry into the glycol dehydrator so that both gas streams may be accurately measured prior to introduction into the sales line. All above ground production facilities installed at each producing well location would be painted a standard environmental color that blends with the surrounding landscape. Refer to Figure 2.5 for a typical production facility layout design for "twin" well locations. As the CRNGDPA develops, the Operator may elect to install centralized production facilities to serve multiple wells within the field. These facilities would be strategically located within the CRNGDPA to provide gas processing and fluids storage for a number of individual wells, thereby reducing the overall cost associated with installation of production facilities on each individual well location. The centralized production facility could also provide an area for surplus equipment storage as well as a field office for personnel employed within the CRNGDPA. The use of centralized production facilities would also increase the area that could be reclaimed on each producing well location. Surface disturbances associated with the installation of centralized production facilities is estimated at a maximum of 10.0 acres overall.

Natural gas production is expected to range from 204,000 to 1,362,000 cubic feet of gas per day from individual wells within the project area. Average field-wide production for the month of October, 1997 was approximately 844,000 cubic feet of gas per day (844 mcfgpd) per well. Table 2.2 shows the typical content of gas produced from the LFU/L undifferentiated Formations in the Cooper Reservoir Natural Gas Field. No hydrogen sulfide (H_2S) is known from these formations, and none is expected to be encountered during project operations (refer to Table 2.2). Some H_2S has been encountered at other well locations in the region. However, this H_2S has been formed biologically, due to contamination of the well bore, and is not naturally present in the natural gas formation(s). Monitoring and due caution would be taken during drilling to ensure that no H_2S is present in the gas stream, and that no biological contamination of the Cooper Reservoir well field occurs.

Condensate production is expected to range from 0 to 20 barrels of condensate per day (bcpd) per well, with an average field-wide production of approximately 7 bcpd per well reported for the month of October, 1997. Condensates consist primarily of long chain hydrocarbon liquids (e.g., pentanes, hexanes, heptanes, octanes) and would be stored in tanks at each individual well location as indicated above (Figures 2.4 and 2.5). In compliance with 43 CFR 3162 and 40 CFR 112.7, all tank batteries would be fenced and bermed with impervious materials to contain the volume of the largest tank plus sufficient freeboard (1 ft) to handle precipitation. Condensates would be periodically removed from storage tanks and transported by truck for sale to refiners for blending purposes. It is anticipated that condensates would be transported from most locations within the project area on an average of once per week.

Water produced in association with the gas stream is expected to range from 0 to 209 barrels of water per day (bwpd) per well, with an average field-wide production of approximately 59 bwpd per well reported for the month of October, 1997. Water is removed from the gas stream through dehydration and the "produced" water is contained in a 400 barrel above-ground produced water tank (see Figures 2.4 and 2.5). Accumulations of produced water would be periodically removed from the storage tank and disposed of in accordance with BLM/WOGCC/WDEQ rules and regulations.

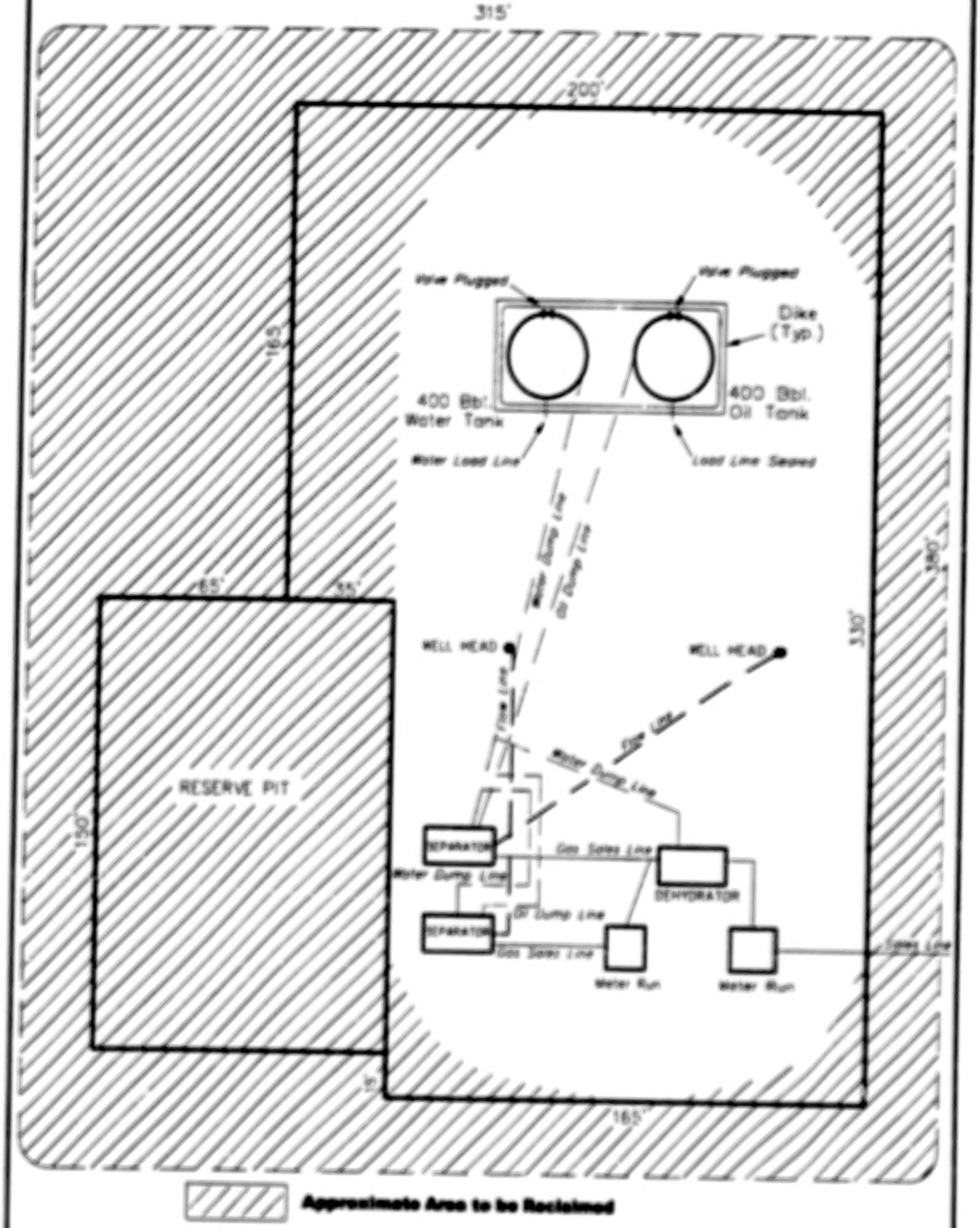


Figure 2.5 Typical Production Facility Layout (Twin Well)

SCALE: 1" = 50'

Table 2.2

Fractional Analysis of Combined Natural Gas from Producing Wells in the Cooper Reservoir Unit on February 11, 1997

Gas Component		Mole
Common Name	**Chemical Formula**	**%**
Nitrogen	N_2	0.511
Methane	C_1	90.440
Carbon Dioxide	CO_2	0.278
Ethane	C_2	5.537
Hydrogen Sulfide	H_2S	0.000
Propane	C_3	1.907
iso-Butane	$i\text{-}C_4$	0.498
n-Butane	$n\text{-}C_4$	0.430
iso-Pentane	$i\text{-}C_5$	0.187
n-Pentane	$n\text{-}C_5$	0.123
Hexanes	C_6	0.088

At the present time, water produced from wells within the CRU is being disposed of either by discharge to the surface or by subsurface injection at the CRU #1 well, which has been converted to a water disposal well. National Pollutant Discharge Elimination System (NPDES) permits were issued by the WDEQ in 1996 for the surface discharge of water produced from the both the CRU #7 (NPDES Permit #WY0036200) and the CRU #8 (NPDES Permit #WY0036218) natural gas wells. Likewise, the WOGCC issued an Underground Injection Control (UIC) permit in 1996 approving the injection of produced water into the shallower geologic horizons of the LFU/L undifferentiated Formations at the CRU #1 (Docket #136-96). Future disposal of produced water in the CRNGDPA, either by surface discharge or subsurface injection under these existing permits, would be subject to continued compliance with the terms and conditions of said permits.

Routine "on-site" maintenance operations on each producing well location would generally include a daily visit by Operator's field employees who monitor the overall operation of the well and make adjustments as required to ensure the most efficient operation of the well. The productive life of wells in the CRU is expected to be in excess of 20 years once they have been drilled, completed, and placed "on line". Reclamation of areas unnecessary for production operations (approximately 1.50 acres) would be completed within a maximum of 2 years following termination of drilling and completion operations, thereby reducing disturbance at each location to approximately 1.25 acres for the LOP.

2.2.8 Pipeline Gathering System

Natural gas produced from wells within the CRNGDPA would be transported from each producing well location via buried pipeline to a connection with a pre-existing natural gas pipeline (gas gathering system) (network) for compression, dehydration, and subsequent delivery to market. These individual well pipelines would generally be routed to the nearest existing gathering line and would be installed below ground and adjacent to existing access roads to the greatest extent possible to minimize the overall surface disturbance resulting from pipeline installation. The maximum width of gathering system pipeline ROW's would be 40 feet, with an average 2,200 feet of buried pipeline required per well in the CRNGDPA. New gas pipelines serving individual wells would be 3-4 inches in diameter and buried to depths of 4-6 feet. Figure 2.6 illustrates typical pipeline construction/installation techniques. Industry standard pipeline equipment, materials, techniques, and procedures in conformance with all applicable regulatory requirements would be employed during construction, testing, operation, and maintenance of gathering system pipelines in order to ensure the safety and efficiency of all pipelines installed in the CRNGDPA.

Depending upon the location of acceptable tie-ins to the existing gathering system, pipeline ROW's would generally be located adjacent to existing roads to the greatest extent possible in order to minimize surface disturbance and maximize construction and gas transport efficiency. Where major excavation is required, sufficient topsoil to facilitate reclamation would be removed from the pipeline ROW's before construction, as determined by the Authorized Officer at the time of pipeline ROW approval. Where ROW's do not require major excavation, vegetation would be removed to ground level by mechanical treatments including either "brush-beating" or scalping, both of which leaves the topsoil intact and minimizes disturbance to plant root systems, thereby facilitating vegetation re-establishment. Brush beating or scalping would typically be limited to an area approximately 15 feet in width along the pipeline ROW. All pipeline ROW reclamation would be initiated as soon as practical following disturbance, but would be completed within a maximum of 1 year following completion of pipeline installation.

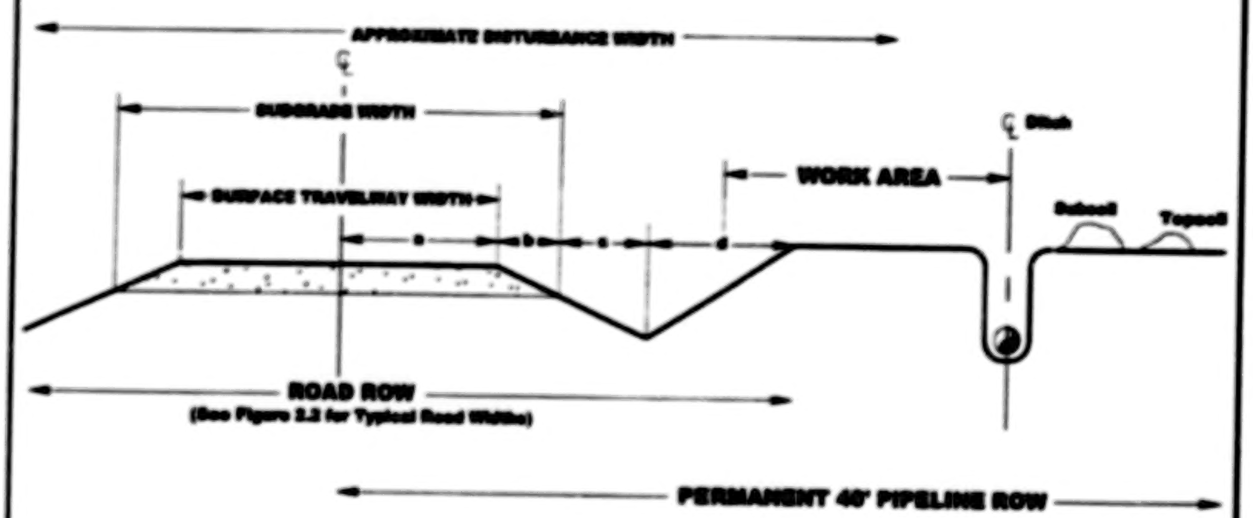
All pipelines would be tested with natural gas to ensure the integrity of newly constructed lines. This testing would consist of filling pipeline segments with natural gas and pressurizing the segments to levels exceeding operating pressures (≈ 1,050 psi). If leaks or ruptures occur, they would be repaired and testing would be repeated until successful. Natural gas used for testing would either be returned to the gathering system for sales or would be vented (released) to the surface in accordance with NTL-4A and/or WOGCC Rule 340.

Pipeline construction crews consisting of approximately 6 laborers would install an average of 850 ft of line per day, and a 0.5 mile pipeline segment would require approximately 3 days to complete. A maximum of 4.85 acres of short-term disturbance would be required per mile of pipeline construction/installation. The total estimated surface disturbance required for pipelines in the CRNGDPA is estimated at 147.48 acres.

2.2.9 Ancillary Facilities

Existing compression (486 hp) within the CRU would be augmented on an as-needed basis to provide sufficient additional compression (up to a maximum of 5,000 hp) to move natural gas into the KN Energy, Inc. (KNE) sales pipeline. These additional compressors would be installed at the existing compressor facility (refer to Figures 1.2 and 1.3) and would require an additional 2.0 acres of surface disturbance for installation.

TYPICAL 4" GATHERING PIPELINE ALONG ACCESS ROAD


APPROXIMATE DISTURBANCE WIDTH
℄
SUBGRADE WIDTH
SURFACE TRAVELWAY WIDTH
a
b
c
d
WORK AREA
℄ Ditch
Subsoil
Topsoil
ROAD ROW
(See Figure 2.2 for Typical Road Widths)
PERMANENT 40' PIPELINE ROW

TYPICAL 4" GATHERING PIPELINE WITH MINIMAL SURFACE DISTURBANCE

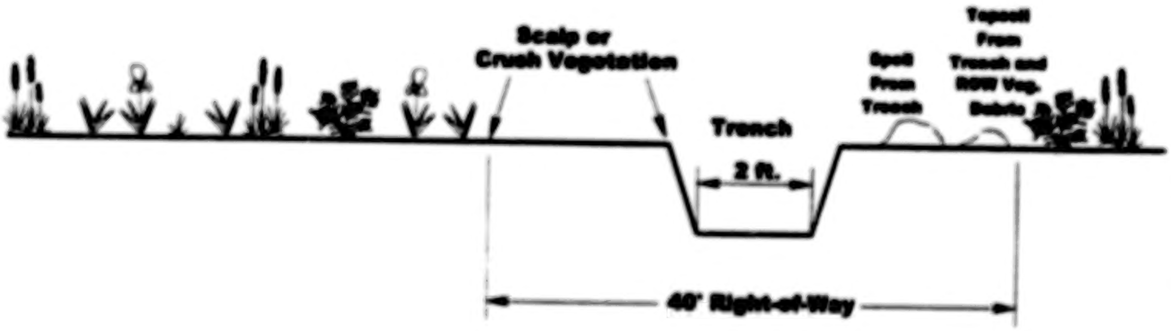

Scalp or Crush Vegetation
Trench
2 ft.
Spoil From Trench
Topsoil From Trench and ROW Veg. Debris
40' Right-of-Way

Figure 2.6: Typical Schematic of Pipeline Installation

NOT TO SCALE

Surface disturbances associated with the initial installation and subsequent enlargement of the compressor facility would require a maximum of 2.0 acres for the LOP. Compressor engines would be fueled by natural gas and would be designed to minimize emissions. A typical stack height for the compressor facility would be 25.25 feet. The facility would not be manned but would be lighted 24 hours per day.

Aggregates to be used for road and well location construction would be acquired from suitable sources (areas) located primarily on federal and state lands in or adjacent to the CRNGDPA. Prior to aggregate extraction, the necessary permits would be obtained from the BLM and/or WDEQ/LQD as appropriate. While no aggregate sources have been identified within or directly adjacent to the CRNGDPA to date, existing sources in the region are believed to have sufficient material to provide the amounts needed for the proposed development.

2.2.10 Hazardous Materials

The Operator has reviewed the EPA's Consolidated List of Chemicals Subject to Reporting Under Title III of the *Superfund Amendments and Reauthorization Act* (SARA) of 1986 (as amended) to identify any hazardous substances proposed for production, use, storage, transport, or disposal by this project, as well as the EPA's List of Extremely Hazardous Substances as defined in 40 CFR 355 (as amended) and determined that numerous materials listed as hazardous and/or extremely hazardous would be used or generated by this project. A summary of this information is available for review at the BLM PRRA in Mills and the Casper District Office. Hazardous materials anticipated to be used or produced during the implementation of the proposed project fall into the following categories:

- drilling materials (sodium hydroxide, fine mineral fibers, heavy metal compounds, etc.);
- casing and cementing materials (fine mineral fibers, polyaromatic hydrocarbons, polycyclic organic matter, aluminum oxide, etc.);
- fracturing materials (fine mineral fibers, etc.);
- production products (natural gas, liquid hydrocarbons, produced water),
- fuels (gasoline, diesel fuel, and natural gas);
- combustion emissions [nitrogen oxides (NO_x), sulfur oxides (SO_x), hydrocarbons, etc.]; and
- miscellaneous materials (methanol, biocides, fertilizers, herbicides, lubricants, etc.).

The Operator, their contractors and subcontractors, would comply with all applicable hazardous material laws and regulations and would locate, handle, and store hazardous substances in an appropriate manner to prevent them from contaminating sensitive resources. Any release of hazardous substances (leaks, spills, etc.) in excess of the reportable quantity as established by 40 CFR 117 would be reported as required by the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) of 1980, as amended. If the release of a hazardous substance in a reportable quantity does occur, a copy of the report would be furnished to the BLM and all other appropriate federal and state agencies. The Operator would also prepare and implement the following plans and/or policies (as deemed appropriate), copies of which would be available for review (as appropriate) at the BLM Casper District and PRRA Offices:

- Spill Prevention, Control, and Countermeasure (SPCC) Plans for those sites which have storage volumes above threshold levels pursuant to 40 CFR 112;

- Spill Response Plans (oil/condensate);

- an inventory of hazardous chemical categories pursuant to Section 312 of SARA, as amended; and

- Emergency Response Plans.

2.2.11 Abandonment

As producing wells within the gas field become commercially non-productive (estimated 20 to 40 year productive life), the Operator would obtain the necessary authorization(s) from the appropriate regulatory agencies to abandon the depleted well. All above ground facilities would be removed, the well bore would be physically plugged with cement, and both the abandoned road and well location reclaimed according to BLM and/or WOGCC recommendations.

2.2.12 Reclamation

All disturbed surfaces would be reclaimed as soon as possible after the initial disturbance. This reclamation would consist primarily of backfilling the reserve pit, leveling and recontouring of disturbed areas, redistribution of stockpiled topsoil over the disturbed areas, installation of erosion control measures, and reseeding as recommended by the appropriate regulatory agency (BLM or WOGCC).

Reclamation of the reserve pit would be accomplished when the pit is no longer required for completion and/or testing operations. Free standing water in the pit would be allowed to evaporate through natural means to the greatest extent possible prior to the commencement of backfilling; however, in some instances the pit contents may be mixed with suitable solid materials and the pit backfilled, as approved by the BLM or WOGCC. Prior to the mixing of reserve pit contents with approved stabilizing materials, the contents of the reserve pit would be tested for total petroleum hydrocarbons (TPH) and toxicity characteristics leaching procedure (TCLP) constituents, and appropriate closure permits would be obtained from the WOGCC/WDEQ. If necessary, reserve pit contents would be removed and disposed of at an approved disposal facility in a manner commensurate with all relevant county, state, and federal regulations and stipulations.

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Reclamation of the well location would be accomplished within a maximum of 2 years following the termination of drilling and completion operations (in the case of productive wells) or well abandonment (in the case of newly drilled dry holes).

2.2.12.1 Producing Well Location

During the initial evaluation phase of operations, the unneeded area(s) of the well pad would be reclaimed as soon as possible after conclusion of drilling, completion and evaluation operations, weather permitting. Reclamation would consist of backfilling the reserve pit, reducing the cut/fill slopes by pushing the fill material back up into the cut, redistributing the stockpiled topsoil over these reclaimed areas, installing erosion control measures, and reseeding as recommended by either the BLM or WOGCC as appropriate. As indicated above, this reclamation would be performed within 2 years of well completion.

2.2.12.2 Access Roads

A minimum of 6 inches of topsoil would be stripped from the access road corridor (new construction portion only) prior to the commencement of construction activities and would be redistributed on the "outslope" areas of the borrow ditch after completion of road construction activities. Erosion control measures would be installed as needed and these borrow ditch areas would be reseeded as soon as practical thereafter. Figure 2.2 shows a typical road cross-section including those "outslope" areas to be reseeded. Likewise, any surface disturbances on/along the "outslope" areas of existing roads within the project area resulting from implementation of the Proposed Action would be reseeded as well.

2.2.12.3 Abandoned Well Location

Upon final abandonment, all existing surface facilities would be removed from the well location as sated in Section 2.2.11. The access road and remaining "work" areas of the well location would be scarified and recontoured, erosion control measures would be installed as necessary, and all recontoured (disturbed) areas would be reseeded as recommended by the BLM or WOGCC.

2.3 APPLICANT-COMMITTED ENVIRONMENTAL PROTECTION MEASURES

The following applicant-committed practices, design features, and procedures would be implemented by Intoil in order to minimize impacts to the environment. Each applicant-committed practice is listed only once, under the first resource where it applies, however, many practices apply to several resources and would reduce impacts to each. These practices, design features, and/or procedures may be waived when deemed inappropriate by the BLM if a thorough analysis determines that the resource(s) for which the measure was developed would not be impacted. Additional site-specific mitigation measures would be identified during the APD and ROW application review processes.

All of the proposed applicant-committed environmental protection measures identified in this section would be implemented on both federal and state lands. Implementation of these measures on private lands would be subject to landowner preferences and agreements with the operator, and where these measures are not implemented additional impacts could occur. Development activities on all lands would be conducted in accordance with all appropriate federal, state, and county laws, rules, and regulations as applicable.

2.3.1 Preconstruction Planning and Design Measures

1. The Operator and BLM would conduct on-site inspections of each proposed disturbance site (e.g., well sites, roads, pipelines, etc.) to develop site-specific recommendations and mitigation measures.
2. Roads required for the proposed project would be constructed in accordance with BLM Manual 9113 standards (USDI-BLM 1985b, 1991).
3. The Operator would prepare and submit individual drill site design plans to the BLM for approval prior to initiation of construction. These plans would show the layout of the well location over the existing topography, dimensions of the well pad, volumes and cross-sections of proposed cuts and/or fills, location and dimensions of reserve and flare pits, and access road design.
4. Prior to construction, the Operator would submit a Surface Use Plan or a Plan of Development for each well site, pipeline segment, and access road project. These plans would enumerate the measures and techniques to be used for erosion control, revegetation, and restoration, and would provide specific detail on project administration, time frames, responsible parties, objectives, characteristics of site predisturbance conditions, topsoil removal, storage and handling, runoff and erosion control, seed bed preparation, recommended seed mixtures, seed application, fertilization, mulching, site protection, weed and livestock or other herbivore control, and monitoring and maintenance.
5. The Operator would slope-stake construction activities on steep and/or unstable slopes when required by the BLM, and would receive approval by the BLM prior to initiating construction.
6. The Operator would identify aggregate and other road material sources for use in drill site and road construction. The appropriate surface management agency would approve these sources, including timing for extraction, prior to use.

2.3.2 Air Quality

1. The Operator would adhere to all applicable Wyoming Ambient Air Quality Standards (WAAQS) and Regulations including those for fugitive dust suppression presented in Wyoming Air Quality

Regulations on Fugitive Dust Suppression Section 14(F) (WDEQ 1995). If a fugitive dust problem is identified by the BLM as a result of this project, immediate abatement measures (e.g., applications of water or chemical dust suppressants to disturbed surfaces) would be initiated in consultation with the BLM and WDEQ to avoid exceeding ambient air quality standards.

2. The Operator would not allow open burning of garbage or refuse at well locations or other facilities in the CRNGDPA. Any other open burning would be conducted under the permitting provisions of Section 13 of the Wyoming Air Quality Standards and Regulations (WDEQ 1995).

2.3.3 Cultural Resources

1. The Operator would follow the Section 106 compliance process prior to any surface disturbing activity.

2. The Operator would halt construction activities if previously undetected cultural resource materials are discovered during construction. The BLM would be immediately notified, and consultation with the SHPO and Advisory Council would be initiated, as appropriate, to determine proper mitigation measures pursuant to 36 CFR 800.11. Construction would not resume until a Notice to Proceed is issued by the BLM.

2.3.4 Geology and Minerals

1. BLM/WOGCC casing and cementing criteria would be followed to protect all subsurface mineral and water-bearing zones.

2.3.5 Hydrology

1. Construction at drainage crossings would be limited to periods of low-or no-flow.

2. The Operator would follow all practical alternatives and designs to limit disturbance within drainage channels, including ephemeral and intermittent draws.

3. A 100 foot wide buffer area of undisturbed land would be left between construction sites and ephemeral and intermittent channels.

4. Channel crossings by pipelines would be constructed so that the pipe is buried at least 4 feet below the channel bottom.

5. Channel crossings by roads and pipelines would be constructed perpendicular to flow.

6. Disturbed channel beds would be reshaped to their approximate original configuration.

7. All reserve pits would be constructed with a minimum of one-half (1/2) the total depth of the pit below the original ground surface on the lowest point within the pit.

8. All reserve pits would be designed with a minimum of 1 foot of freeboard.

9. The discharge of all water (storm water, produced water, etc.) would be done in conformance with WDEQ/WQD, BLM, and WOGCC rules and regulations (WDEQ 1990; BLM Onshore Oil and Gas Order No. 7).

10. The Operator would prepare SWPPPs for all disturbances greater than 5 acres in size as required by WDEQ NPDES permit requirements. In some instances, SWPPPs for groups of wells would be developed.

11. The Operator would implement SPCC Plans if liquid petroleum products or other hazardous materials are stored on-site in sufficient quantities, in accordance with 40 CFR 112.

2.3.6 Range

1. Removal or disturbance of vegetation would be kept to a minimum through construction site management (e.g., by utilizing previously disturbed areas, using existing ROW's, designating limited equipment/material storage yards and staging areas, scalping, etc.) where and as feasible.

2. The Operator would seed and stabilize disturbed areas in accordance with management direction from the appropriate surface management agency or private surface owner, as appropriate.

3. The Operator would monitor for noxious weeds and apply BLM-approved weed control techniques (e.g., soil sterilants, biological controls), as necessary with the prior approval of the Authorized Officer, BLM.

2.3.7 Soils

1. Prior to commencement of construction activities, all available topsoil (up to a maximum of 12 inches) would be stripped from areas of cut, fill, and subsoil storage, and stockpiled for future reclamation operations.

2. The Operator would keep the area of disturbance to the minimum necessary for drilling and subsequent production activities, while providing for worker safety on site.

3. The Operator would restrict off-road vehicle activity by employees and contract workers.

4. The Operator would restrict project-related travel and reclamation activities during periods when soils are saturated and excessive rutting could occur.

5. Where feasible, the Operator would locate pipelines immediately adjacent to roads or other pipelines to avoid creating separate areas of disturbance.

6. The Operator would minimize construction activities in areas of steep slopes and apply special slope stabilizing structures and techniques (e.g., mulch, matting, etc.) if construction cannot be avoided in these areas.

7. The Operator would not conduct construction and/or reclamation activities using frozen or saturated soils, unless an adequate plan is submitted and approved by the BLM that demonstrates potential impacts would be mitigated.

8. Runoff and erosion control measures such as water bars, berms, and interceptor ditches would be installed as necessary.

9. All drainage crossing structures would be designed to carry at least a 10 year storm event, pursuant to guidelines contained in BLM Manual, Section 9113 (USDI-BLM 1985b, 1991).

10. Upon completion of drilling operations and/or production facility installation, the Operator would restore those areas disturbed in conjunction therewith to the approximate original contours.

11. The Operator would replace topsoil or suitable growth materials over all disturbed surfaces prior to reseeding.

12. The Operator would reseed all disturbed sites as soon as practical following disturbance.

2.3.8 Transportation

1. Existing roads and trails would be utilized to the greatest extent possible and upgraded as necessary to comply with BLM road construction specifications.

2. All roads not required for routine operation and maintenance of producing wells or ancillary facilities would be reclaimed as directed by the BLM, State Land Board, or private landowner. These roads would be permanently blocked, recontoured, reclaimed, and revegetated by the Operator, as would disturbed areas associated with permanently plugged and abandoned wells.

3. The Operator would comply with existing federal, state, and county requirements and restrictions to protect road networks and the traveling public.

4. Special arrangements would be made with the WDOT to transport oversize loads to the CRU. Otherwise, load limits would be observed at all times to prevent damage to existing road surfaces.

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5. All development activities along approved ROW's would be restricted to areas authorized in the approved ROW.

6. The Operator would be responsible for maintenance of roads in the project area and for closure of roads following production activities.

7. Where proposed roads would follow existing roads, those portions of existing roads not included in the new ROW would be reclaimed and revegetated by the Operator.

2.3.9 Wildlife

1. Reserve, workover, and evaporation/production pits potentially hazardous to wildlife would be adequately protected (e.g., fencing, netting) to prohibit wildlife access as directed by the BLM, to ensure protection of migratory birds and other wildlife.

2. USFWS and WGFD consultation and coordination would be conducted for all mitigation activities relating to raptors, and T&E species and their habitats and all permits required for movement, removal, and/or establishment of raptor nests would be obtained.

3. The Operator would implement policies designed to control poaching and littering and would notify all employees (contract and company) that conviction of a major game violation could result in disciplinary action. Contractors would be informed that any intentional poaching or littering within the CRNGDPA could result in dismissal.

4. Firearms and dogs would not be allowed on-site during working hours. The Operator has existing drug, alcohol, and firearms policies that would be internally enforced.

2.4 NO ACTION ALTERNATIVE

The *National Environmental Policy Act* of 1969 (NEPA) requires that the "No Action" alternative be considered in all environmental documents. Under the No Action Alternative, the BLM would deny further natural gas exploration and development on federal lands in the CRNGDPA as currently proposed by the Operator, while allowing other land and resource uses to continue without the impacts which would be associated with the development proposal. Denial of the current development proposal is not, however, a denial of all natural gas development in the area. Under the No Action Alternative, development of lands in the CRU and adjoining areas could occur at levels similar to those which have occurred on the area in the past and could occur as authorized by existing management directives contained in the Platte River RMP, which includes the requirement for a site-specific NEPA analysis.

The decision to select the No Action Alternative for exploration and development in the CRU is available to the BLM through denial of individual APD's, however, the right to drill and develop somewhere within the leasehold cannot be denied by the Secretary of the Interior. Consequently, the BLM's authority to implement the No Action Alternative is somewhat limited. This limitation is based upon the fact that valid leases have been issued which specifically grant the lessee (or his designated operator) the *"right to drill for, ...extract, remove and dispose of all oil and gas deposits"* in the leased lands subject to the terms and conditions of the respective leases. Because the Secretary of the Interior has the authority and responsibility to protect the environment within federal oil and gas leases, restrictions can be imposed on the lease terms (see *Cooper Valley Machinery Works, Inc.* vs. *Andrus*, 474 F. Supp. 189, 191; D.D.C. 1973; 653 F. 2nd 595; D.D.C. 1981; *Natural Resources Defense Council vs. Berkland*, 458 F. Supp. 925, 937, D.D.C. 1978), but the secretary can not deny development of the lease.

The Tenth Circuit Court of Appeals in *Sierra Club vs. Peterson* (717 F. 2nd 1409, 1983) found that *"on land leased without a No Surface Occupancy stipulation, the Department cannot deny the permit to drill...once the land is leased the Department no longer has the authority to preclude surface disturbing activity even if the environmental impact of such activity is significant. The Department can only impose mitigation measures upon a lessee who pursues surface disturbing exploration and/or drilling activities"*. The court goes on to say *"...notwithstanding the assurance that a later site-specific environmental analysis will be made, in issuing these leases the Department has made an irrevocable commitment to allow some surface disturbing activities, including drilling and road building"*.

This has been clarified somewhat in Instruction Memorandum 92-67 issued by the Director, Bureau of Land Management on December 3, 1992 which states that *"...Because all oil and gas activities are subject to FLPMA, mitigation required to protect public lands from unnecessary and undue degradation is consistent with the lease rights granted. The caveat, however, is that...unnecessary and undue degradation implies that there is also necessary and due degradation"*. As a matter of policy, any mitigation measures *"...which would render a proposed operation uneconomic or technically unfeasible is not considered to be consistent with a lessee's rights and cannot be required absent a lease stipulation, unless it is determined that such mitigation is required to prevent unnecessary and undue degradation of public lands or resources..."*. To deny all activity would thus constitute a "taking" of the Operators right to conduct exploration activities on the subject federal leases. As the court held in *Union Oil Company of California vs. Morton*, *"Congress itself can order leases forfeited, subject to payment of compensations. But without Congressional authorization, the Secretary of the executive branch in general has no intrinsic power of condemnation"*.

Based upon the above, selection of the No Action Alternative would deny the proposal as submitted, but would allow BLM to consider additional exploration and development of the federal mineral estate on a case by case basis through individual APD's and site specific environmental analysis. Off-lease access to drill sites and/or the transportation of natural gas products would also be considered on a case by case basis by BLM. Additional oil/gas exploration and development activity could occur on the non-federal mineral estate within the CRNGDPA subject to the approval of the WOGCC and the affected surface owner(s).

Many leases in the CRNGDPA (outside of the CRU) contain various stipulations addressing surface disturbance, steep slopes, wildlife, and other matters of concern. These stipulations would allow the BLM to preclude development in certain areas (e.g., where slopes exceed 25%) or at certain times of the year (e.g., to protect big game crucial winter habitat) if operations cannot be acceptably mitigated. However, there is no stipulation, such as a NSO, that would allow the BLM to preclude drilling operations everywhere on a lease at all times of the year. If any one of the stipulations cannot be acceptably implemented and impacts mitigated, then an exception would not be granted. A decision, therefore, of no action, as authorized by the leases, would only be considered, given one of the following conditions:

- If there were no acceptable means of mitigating significant adverse impacts to stipulated surface resource values, then this would trigger denial of the APD and require consideration and analysis of another alternative(s). Effectively, exception(s) to one or more of the lease stipulations would not be approved.

- If the USFWS concluded that the Proposed Action and alternatives would likely jeopardize the continued existence of threatened or protected plant and animal species, then the APD and lease development may be denied in whole or in part.

This EA will help to determine whether the proposed project meets any of these conditions.

2.5 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DEPTH

Potential well densities and/or spacing patterns in the CRNGDPA were examined by BLM's Reservoir Management Group (RMG) during initial project design. This examination reviewed geologic data from a variety of sources, both published and unpublished, in order to estimate the level of drilling activity which could be expected in the CRU and adjacent areas. As a result of this examination, the RMG concluded that development within the boundaries of the CRU in addition to those wells which have already been drilled or received approval to drill. In contrast, exploration, and development of those lands outside of the CRU, but within the boundaries of the CRNGDPA, would most likely be on a 160-acre spacing pattern. This would result in the drilling of approximately 26 wells on lands outside of the CRU.

Upon further review, this alternative was rejected because the total extent of exploration and development activity necessary to fully recover natural gas resources in the CRNGDPA is presently unknown. By limiting the overall number of wells in the CRNGDPA, this alternative could inadvertently lead to the by-pass and/or depletion of the federal mineral estate and/or the necessity for future NEPA analyses. Additionally, the BLM has limited authority over the development of private lands and non-federal minerals within the CRU and alternatives guiding development on these lands were therefore considered unreasonable.

3.0 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This chapter describes the affected environment in the vicinity of the Proposed Action (the project area) as it exists today, where pertinent existing development, impacts, and disturbances are described. This description is organized by resource with descriptive information taken from a wide range of sources including the BLM and various other federal and state agencies.

3.1.1 Environmental Elements Not Present Within the Project Area

For the purposes of this document, the following resources are not present in the project area and, therefore, would not be adversely affected by implementation of the Proposed Action. Consequently, these resources will not be addressed in this chapter or in Chapter 4.0 (Environmental Consequences) to follow.

- **Floodplains, Wetlands and Prime or Unique Farm Lands -**

  Floodplains and/or wetlands as defined in Executive Orders 11988 and 11990 would not be affected by the Proposed Action. Likewise, there are no prime or unique farm lands that would be affected by the Proposed Action.

- **Wilderness Areas, Wilderness Study Areas and Areas of Critical Environmental Concern -**

  The project area is not located in either an existing or proposed wilderness/primitive area, a wilderness study area (WSA), or an area of critical environmental concern (ACEC).

- **Primary or Sole Sources of Drinking Water -**

  The Proposed Action would not affect any primary or sole sources of drinking water.

- **Wild and Scenic Rivers -**

  There are no designated or candidate wild and scenic rivers that would be affected by the Proposed Action.

3.1.2 Environmental Elements Considered With Minor Effects

The following resources would not be adversely affected by implementation of the Proposed Action. Consequently, these resources will also not be addressed in this chapter or in Chapter 4.0 *(Environmental Consequences)* to follow.

- Fisheries - there are no perennial streams in or adjacent to the CRNGDPA; consequently, there are no fisheries that could be affected by the Proposed Action.

- Paleontology - while the Eocene Wind River Formation is known contain scientifically significant fossils throughout the Wind River Basin, bedrock outcrops which could contain significant fossils are noticeably absent throughout the majority of the project area. Moreover, past construction activity within the CRU has failed to encounter bedrock deposits or paleontological remains. Mitigation recommended in Section 4.3.4 should prove adequate to protect any isolated paleontologic resources which might be encountered as a result of additional oil/gas exploration and development activity in the CRNGDPA.

- Recreation - the project area consists of a mosaic of fee (42.1%), state (15.9%), and federal (42.0%) lands (see Table 1.1 and Figure 1.4), with those isolated tracts of federal land in the northern portion of the CRNGDPA being effectively "landlocked" due to the general lack of a public easement thereto. Access to a large block of federal lands in the south/southwest portion of the CRNGDPA is provided by Natrona County Road #212. However, considering that there are no special recreation management areas or developed recreational sites within the project area and the ownership patterns, recreational opportunities within the CRNGDPA are somewhat limited and would not be adversely affected by the Proposed Action.

- Socioeconomics - neither the economy of Natrona County nor the quality of life for the residents thereof will be adversely affected by the Proposed Action. As described in Chapter 2.0, additional oil/gas exploration and development activity in the CRNGDPA would not result in an increase in the local workforce, with a concomitant burden on the resources of Natrona County and the infrastructure thereof. In point of fact, implementation of the Proposed Action would actually have a positive impact on the economy of Natrona County through increased revenues generated by additional hydrocarbon production from leases within the project area.

- Vegetation - considering that there are no T/E or candidate plant species known to occur within the CRNGDPA, the long-term disturbance of 287.25 acres (4.57% of the total surface acreage) over the LOP does not represent a significant impact to plant communities within the CRNGDPA.

3.2 GENERAL SETTING

The project area is generally situated on the extreme eastern periphery of the Wind River Basin, an intermontane basin which is located within both the Middle Rocky Mountain Division of the Northern

Rocky Mountain Physiographic Province and the Great Plains Division of the Great Plains Physiographic Province (Peterson *et al* 1987). More specifically, the CRNGDPA is situated on the eastern flank of the Wind River Basin, an area which is generally characterized by rolling to sometimes steep semi-mountainous terrain dissected by numerous ephemeral tributary drainages of the South Fork of the Powder River. Elevations in the project area generally range from a low of 5,980 feet along the South Fork of the Powder River at a point located in the SE¼NE¼SW¼ of Section 11, Township 35 North, Range 87 West to a high of 6,409 feet at the southeast corner of Section 32, Township 36 North, Range 87 West.

3.3 AIR QUALITY

3.3.1 Climate, Precipitation, and Winds

The project area is located in a continental semi-arid, cold-temperate-boreal climate (Trewartha 1968). This climate is characterized by a lack of moisture (where evaporation exceeds precipitation), which leads to hot summer days and cool summer nights, but bitterly cold winters. On average, fewer than eight months exceed monthly temperatures greater than 50 degrees Fahrenheit (°F).

Air masses enter the region from the Pacific, and mountains to the west act as effective moisture barriers. The majority of the precipitation occurs as a result of late spring and summer thunderstorms, which coincide with the growing season. The remainder of the precipitation comes in the form of snowfalls, primarily from November through April, with heaviest snowfall in the spring. Annual average precipitation ranges between 10 and 14 inches, with a peak average maximum monthly precipitation of 2.1 inches in May (NOAA 1992). Most precipitation occurs as rain due to frontal systems and thunderstorms. The predicted 50-year, 24-hour intense precipitation amount is 2.6 inches, as generated by extreme thunderstorm events. Average annual total snowfall is approximately 40 inches, with the greatest snowfall occurring during March and April. Due to drifting and sublimation, the snow cover is usually discontinuous.

Monthly mean temperatures range from a January low of nearly 23°F to a monthly mean high of about 71°F in July, with average daily low and high temperatures ranging from 8°F to 30°F in January, and 52°F to 86°F in July. However, as is characteristic of dry continental climates, temperature extremes are pronounced: a record low temperature of -41°F in December and a record high temperature of 104°F in July have been measured in Casper (NOAA 1992). The average number of days per year with a minimum temperature at or below 32°F is 200 days and the average number of days per year with a maximum temperature at or above 90°F is 20 days.

Mean annual evaporation ranges from 45 inches (lake) to 70 inches (pan); therefore the potential evaporation is 21 to 23 inches, compared to the mean annual precipitation of 10 to 14 inches (Martner 1986). This gives an annual deficit of nearly 12 inches, creating a predominantly dry climate where evaporation exceeds precipitation.

Average winds are highly directional. As can be seen from the wind rose in Figure 3.1, winds from the southwest and west-southwest account for over 40 per cent of the total hourly wind directions (SCRAM 1994). In fact, all monthly average prevailing wind directions recorded by NOAA (1992) at Casper occur either in the southwest or west-southwest directions, indicating strong direction dependency. Wind speeds are uniformly high in Casper, ranging from a monthly mean low wind speed of nearly 10 miles per hour (mph) in July, to a maximum monthly mean wind speed of over 16 mph in January (NOAA 1992). The uniformly high wind speeds enhance dispersion, prompting lower pollutant concentrations than would occur in the absence of steady, high wind speeds. Strong, sustained winds occur quite often, and observations indicate winds of 70 to 80 mph (with gust to 100 mph) can occur throughout Wyoming.

Potential severe weather conditions and frequency of occurrence may be summarized as follows (Rykaczewski *et al* 1980). From 1916 through 1967, the Wyoming State Climatologist has reported fifteen tornadoes in the Casper District. For the same reporting period, 165 tornadoes occurred Statewide, with 45 per cent occurring in June, 42 percent in May and July, and twelve per cent occurring during the other nine months.

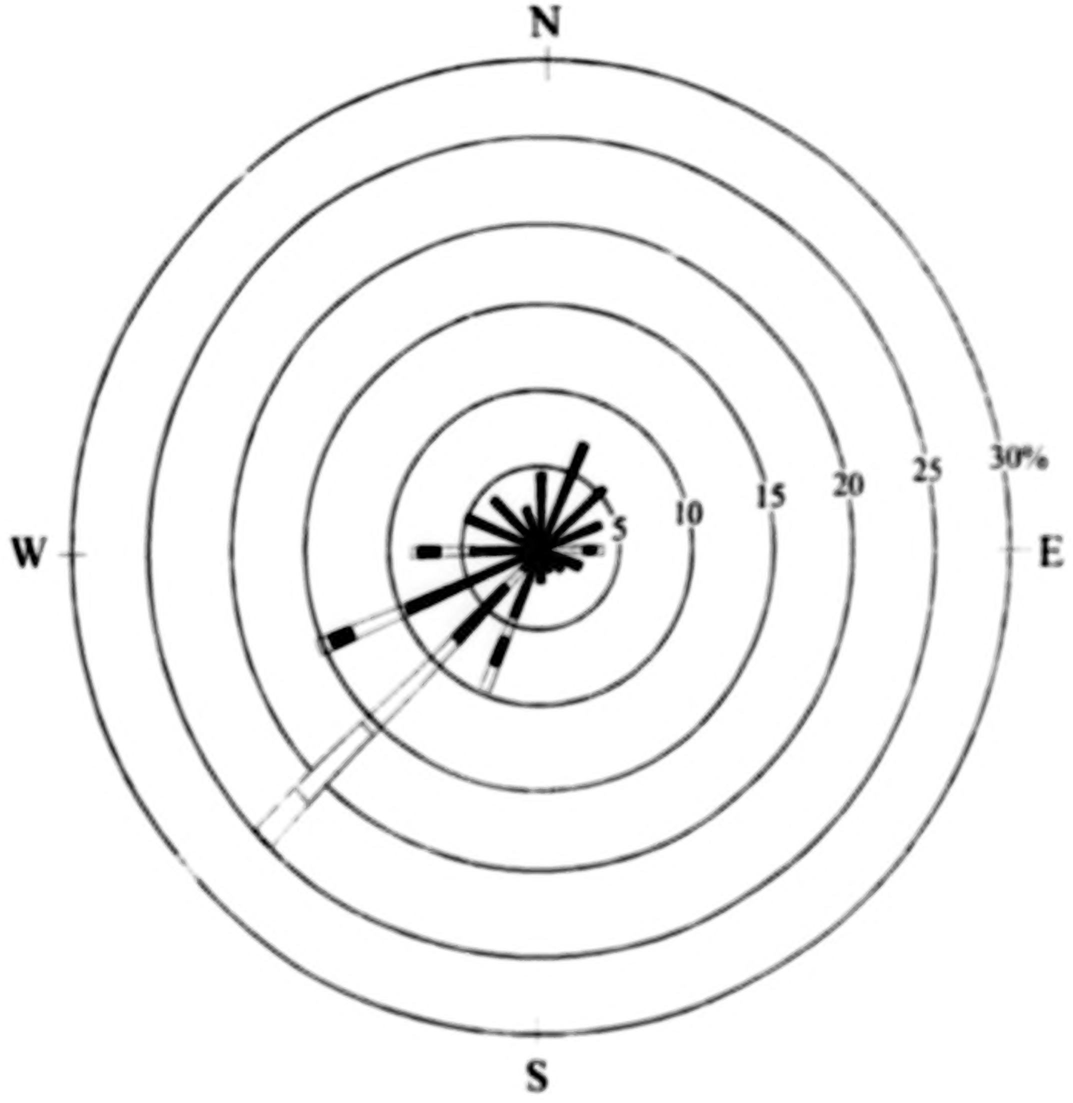
The majority of thunderstorms occur between April and September, with most occurring in June and July. The Casper District averages 40 to 50 days with thunderstorms annually. Large hail, strong winds, and occasional tornadoes are associated with severe thunderstorms. The Casper District averages between two and four days with hail each year. Lightning is commonly associated with summer thunderstorms, although damage and occurrence data are not often reported.

3.3.2 Air Quality

Current and complete monitoring data for ambient air quality are not available for the Cumulative Impact Study Area. However, based on data collected in similar locations and reviewed by the State of Wyoming, Department of Environmental Quality, Air Quality Division (WDEQ/AQD), air quality levels are assumed to be in attainment for all Wyoming Ambient Air Quality Standards (WAAQS) and National Ambient Air Quality Standards (NAAQS).

Estimation of background air pollutant concentrations (reported in micrograms per cubic meter, or $\mu g/m^3$) is necessary in order to compare potential total air quality impacts from the Proposed Action and Alternatives with applicable air quality standards. Thus, for comparison against an applicable standard, total impacts are the sum of the background concentration plus direct modeled impacts. It is important that individual background concentration values, model predictions, and applicable air quality standards are for the same averaging time period for each pollutant.

Background air pollutant concentration data were provided by WDEQ/AQD (WDEQ 1996). Background concentrations of carbon monoxide (CO) are taken from representative data collected by WDEQ/AQD and commercial operators, and summarized in the Riley Ridge EIS (USDI-BLM 1983). Nitrogen dioxide (NO_2) and sulfur dioxide (SO_2) gaseous air pollutant data were gathered at the Lost Cabin Gas Plant site in Fremont County (1986-87).



WINDROSE
Casper, Wyoming
Period: 1987-91

NOTES:

DIAGRAM OF THE FREQUENCY OF OCCURRENCE FOR EACH WIND DIRECTION. WIND DIRECTION IS THE DIRECTION FROM WHICH THE WIND IS BLOWING.

EXAMPLE: WIND IS BLOWING FROM THE NORTH 3.3 PERCENT OF THE TIME.

SOURCE: EPA 1997

Figure 3.1 Wind Direction Rose for the CRNGDPA

Ozone data were collected in Pinedale, Wyoming (1993-1994). Total Suspended Particulate Matter (TSP) and Particulate Matter less than 10 microns in effective diameter (PM_{10}) were collected in an urban area at the Casper City and County Building (1995). Background air pollutant concentrations and applicable air quality standards are summarized in Table 3.1 (WDEQ 1995, WESTAR 1995).

Table 3.1

Background Air Quality Concentrations, Standards and PSD Increments (in $\mu g/m^3$)

Airborne Pollutant	Averaging Time [1]	Background Concentration	Air Quality Standards		PSD Increments	
			WAAQS	NAAQS	Class I	Class II
Carbon Monoxide (CO)	1-hour	3,500	40,000	40,000	none	none
	8-hour	1,500	10,000	10,000	none	none
Nitrogen Oxide (NO_2)	Annual	2	100	100	2.5	25
Ozone (O3)	1 -hour	110	160	235	none	none
Sulfur Dioxide (SO_2)	3-hour	93	1,300	1,300	25.0	512
	24-hour	32	260	365	5.0	91
	Annual	4	60	80	2.0	20
Total Suspended Particulates (TSP)	24-hour	70	150	none	none	none
Particulate Matter 10 (PM_{10})	24-hour	42	150	150	8.0	30
	Annual	19	50	50	4.0	17

Sources: WDEQ 1995, WDEQ 1996, and WESTAR 1995.

1. Short-term concentrations reflect the maximum measured values during the entire period of record (i.e.; NO_2: 1986 through 1987, TSP and PM_{10}: annual 1995, etc.), except for ozone, which reflects the 90*th* percentile of hourly ozone values measured at Pinedale, Wyoming (1993 through 1994). Short-term (1-hour, 3-hour, etc.) standards allow not more than one expected exceedance per year. Long-term (annual) standards are not to be exceeded.

3.4 CULTURAL RESOURCES

Approximately 408.5 acres have been inventoried for cultural resources in conjunction with previous surface disturbing activities within the overall project area. These inventories were conducted in compliance with the *National Historic Preservation Act* (NHPA) and included lands within the CRNGDPA which were potentially affected by construction activities associated with those projects identified in Table 3.2. As a result of these inventories, 5 individual cultural properties were identified within the inventoried area(s), 2 of which are considered as potentially eligible for listing on the National Register of Historic Places (NRHP). Copies of the cultural resource inventories referenced in Table 3.2 are currently on file with in both the BLM's PRRA office and with the Wyoming State Historic Preservation Office (SHPO) in Laramie, Wyoming.

Table 3.2

Projects Inventoried for Cultural Resources within the CRNGDPA, Acres Inventoried, and Inventory Results

Facility Operator	Facility Name and Number	Acres Surveyed for Cultural Materials				Sites Identified	Eligible Sites
		Location	Access	Pipelines	Other		
BLM/Casper District	Skyline H_2O P/L	-----	-----	2.31	-----	0	0
Integrity Oil & Gas	1-4 DS Federal	40.00	32.20	-----	-----	3	2
Integrity Oil & Gas	1-33 WS Federal	40.00	0.00	-----	-----	0	0
Integrity Oil & Gas	2-33 Federal	40.00	4.00	-----	-----	0	0
Intoil, Inc.	CRU # 6	10.00	5.70	9.40	-----	0	0
Intoil, Inc.	CRU # 7	10.00	2.90	-----	-----	0	0
Intoil, Inc.	CRU #10	20.00	0.20	-----	-----	1	0
Intoil, Inc.	CRU #12	16.20	6.24	-----	-----	0	0
Intoil, Inc.	CRU #13	15.30	0.00	-----	-----	0	0
Intoil, Inc.	CRU #14	10.00	4.30	-----	-----	0	0
Intoil, Inc.	CRU #15	10.00	1.30	-----	-----	0	0
Intoil, Inc.	CRU #16	10.00	3.30	-----	-----	0	0
Intoil, Inc.	CRU #17	10.00	0.00	-----	-----	0	0
Intoil, Inc.	CRU #18	10.00	2.90	-----	-----	0	0
Intoil, Inc.	Compressor Sta.	1.00	0.00	-----	39.70	0	0
Prima Oil & Gas Co.	Federal 11-23	40.00	11.50	-----	-----	1	0
Totals		**282.50**	**74.54**	**11.71**	**39.70**	**5**	**2**

The cultural resource inventories referenced in Table 3.2 involved portions of 14 sections within the CRNGDPA, 8 of which were located in Township 35 North, Range 87 West, with the remaining 6 sections located in Township 36 North, Range 87 West. These inventories identified 3 prehistoric cultural properties recorded by Powers Elevation Company prior to 1980 in conjunction with the Integrity Oil & Gas Company 1-4DS Federal well location. A brief synopsis of these cultural properties is provided below:

- Site 48NA992 is reported as a "hearth, firepit, fire-cracked rock, charcoal" site and is located in Section 4 of T35N, R78W. This site is considered as eligible for inclusion to the NRHP.

- Site 48NA993 is reported as a "bison pound/kill, bone bed, bone scatter" site and is located in Section 34 of T36N, R87W. The site is also considered as eligible for inclusion to the NRHP.

- Site 48NA249 is reported as a "possible camp, work area, lithic scatter, flakes" site and is located in Section 33 of T36N, R87W. The file search states that the site form contains information concerning the eligibility of said site for inclusion to the National Register of Historic Places (NRHP); however, the actual site form contains no mention of site eligibility but recommends that the site be avoided and that subsurface cultural materials may be present therein.

In addition to the prehistoric sites identified above, 3 historic sites have also been recorded within the CRNGDPA and include 2 stock (sheep) herder camps (48NA994 and 48NA2499) and 1 stone cairn (48NA2469).

3.5 GEOLOGY AND MINERALS

Geologic units within the CRNGDPA include the Meeteetse and Lance Formations of Late Cretaceous age, Paleocene Fort Union, and Eocene Wind River Formations. The primary geologic units that are targeted for natural gas exploration and development activity within the area are the Lance and lower Fort Union Formations.

Johnson *et al* (1996) describes the Lance Formation as consisting of interbedded fine to coarse grained, in part conglomeratic sandstone, shale, mudstone, carbonaceous shale, and thin coal beds. Sandstone generally prevails in the lower part of the formation and finer grained strata in the upper part. Very coarse to conglomeratic sandstones occur in the western part of the Wind River Basin, reflecting local uplift and erosion of highlands adjacent to the subsiding Wind River Basin trough (Keefer and Troyer 1964), but no conglomerates have been observed in exposures along the southern and eastern margins of the basin. The Lance ranges in thickness from a wedge-edge where it is truncated beneath younger rocks along the southern margin of the Wind River Basin to a maximum of 6,860 feet in the northeastern part of the basin (Johnson *et al* 1996). The contact between the Lance Formation and the overlying lower member of the Fort Union Formation is difficult to distinguish in the deeper parts of the Wind River Basin as all of these strata were deposited under similar depositional conditions that persisted from late Cretaceous into Paleocene times (Johnson *et al* 1996). The Fort Union Formation was divided into three members in the Wind River Basin by Keefer (1961a, 1961b, 1965, 1969) and include (in ascending order) the lower unnamed member (lower Fort Union), the Waltman Shale, and the Shotgun member. The lower member is mainly of fluvial origin and was described by Keefer (1965) in a surface section near Waltman as consisting predominantly of white fine to very coarse grained sandstone and siltstone. Keefer (1961b) indicated that the contact between the lower Fort Union and the Waltman Shale member is sharp and well defined on geophysical logs (Johnson *et al* 1996).

3.5.1 Geology

During the late Cretaceous period, numerous streams and rivers were meandering over a relatively flat basinal area in what is known today as the Wind River Basin. These rivers and streams generally flowed to the east/northeast into the Cannonball Sea, located in modern day South Dakota and were largely responsible for the deposition of over 11,000 feet of sediment in the deeper portions of the basin. These sediments were composed primarily of channel sandstones, shales, carbonaceous shales, siltstones, and coals which originated in the emerging Granite and Wind River Mountain ranges (Anderson 1995).

As the Granite and Wind River Mountains continued to be elevated, these streams and rivers formed a fluvial system that deposited sandstone(s) in a sequence that today is identified as the lower unnamed member of the Fort Union (LFU) and Lance Formations. Depending upon the rate of deposition and the ability of the rivers and streams to erode the emerging mountain ranges, differential sandstone deposition occurred which makes it difficult to distinguish between the LFU and Lance Formations in this portion of the Wind River Basin. During this period of deposition, the Wind River Basin was filling from the center outward to the edges of the basin. As the basin filled, subsequent rises in the mountain ranges resulted in an accelerated rate of erosion and concomitant deposition of sediments into the basin, creating wedge-shaped deposits of sediments. These tilted wedges thickened to the north and this depositional sequence in the LFU/Lance was repeated numerous times, resulting in an indistinguishable rock package that is difficult to identify or separate by formation by any means other than palynology. As a result, the Lance Formation can not be accurately separated from the LFU Formation using rock type, seismic data, or well logs in the Wind River Basin. Consequently, all that can be done to differentiate between these two formations is to split the fluvial package which comprises the LFU/Lance (LFU/L) Formations at some point (Anderson 1995).

Based on this information, the LFU/L Formations, undifferentiated within the CRU have been defined as the rocks which occur from the base of the Waltman Shale member of the Fort Union Formation to a depth of 6,000 feet below the base of the Waltman Shale member. All rocks between this depth and the top of the Meeteetse Formation are defined as the Lance Formation.

3.5.2 Minerals

The project area is situated in and adjacent to the Cooper Reservoir Natural Gas Field, discovered by Chevron U.S.A. in June, 1959 when production was established from the LFU Formation at the Cooper Reservoir Unit #1 well location. After the initial discovery, Chevron drilled 4 additional wells between 1959 and 1964 which also tested the productive potential of the LFU in the Cooper Reservoir Unit. These 4 wells were subsequently plugged and abandoned by Chevron (see Figure 1.2 and Table 3.3).

Intoil acquired the CRU from Chevron in 1991 and has since drilled 9 additional wells therein, all of which produce from either the LFU or LFU/L undifferentiated Formation (or both). Since it's initial discovery in 1959, the Cooper Reservoir Field has produced a cumulative total of 4,766 barrels of condensate and 13,497,740 mcf of natural gas. At the end of 1995, there were four (4) producing wells within the Cooper Reservoir Field which produced 558 barrels of condensate and 74,614 mcf of natural gas during the month of December, with a cumulative total of 3,601 barrels of oil (condensate) and 483,939 mcf of natural gas produced for the entire year (WOGCC 1997).

Table 3.3

Previous Oil/Gas Exploration and Development Activity within the CRNGDPA

Operator of Well	Well Name and Number	Legal Location of Oil/Gas Well				Year Drilled	Current Status
		Quarter	Section	Township	Range		
Chevron, U.S.A.	CRU #1	SE¼SW¼	3	35 North	87 West	1959	INJ [1]
Chevron, U.S.A.	CRU #2	SE¼SW¼	34	36 North	87 West	1959	D/A
Chevron, U.S.A.	CRU #3	SE¼SW¼	4	35 North	87 West	1960	P/A
Chevron, U.S.A.	CRU #4	SE¼SW¼	10	35 North	87 West	1964	P/A
Chevron, U.S.A.	CRU #5	SW¼NE¼	15	35 North	87 West	1964	P/A
Harvey Broyles	Federal #1	NW¼SE¼	9	35 North	87 West	1968	D/A
Integrity Oil & Gas	1-4 DS Federal	NE¼NW¼	4	35 North	87 West	1978	SI [2]
Integrity Oil & Gas	1-33 WS Federal	NW¼SE¼	33	36 North	87 West	1974	SI [2]
Integrity Oil & Gas	2-33 Federal	SW¼NW¼	33	36 North	87 West	1979	P/A
Intoil, Inc.	CRU # 6	SE¼NW¼	10	35 North	87 West	1994	PGW
Intoil, Inc.	CRU # 7 [3]	SW¼SW¼	3	35 North	87 West	1995	PGW
Intoil, Inc.	CRU # 8 [3]	SE¼NE¼	4	35 North	87 West	1995	PGW
Intoil, Inc.	CRU # 9 [3]	NW¼NE¼	3	35 North	87 West	1996	SI
Intoil, Inc.	CRU #10 [3]	SW¼SE¼	3	35 North	87 West	1996	PGW
Intoil, Inc.	CRU #11	NE¼NE¼	4	35 North	87 West	1996	PGW
Intoil, Inc.	CRU #12	NW¼NE¼	10	35 North	87 West	1997	PGW
Intoil, Inc.	CRU #13 [3]	NW¼NW¼	10	35 North	87 West	1997	PGW
Intoil, Inc.	CRU #14 [3]	SW¼SE¼	4	35 North	87 West	1997	WOC
Terra Resources, Inc.	6-2 Federal	SE¼NW¼	2	35 North	87 West	1974	D/A

Notes:
1. Well is currently operated by Intoil as an injection well for the disposal of water produced in the CRU.
2. Wells are currently operated by Warren Enterprises, Inc.
3. Locations with "twin" wells.

3.6 HYDROLOGY

3.6.1 Surface Hydrology

The CRNGDPA encompasses portions of 4 separate watersheds (see Figure 3.2). These watersheds are identified below along with the approximate acreages of each watershed within the project area.

1. Adobe Reservoir, containing approximately 450 acres or 7.16% of CRNGDPA.

2. Poison Creek Tributary, containing approximately 339 acres or 5.40% of CRNGDPA.

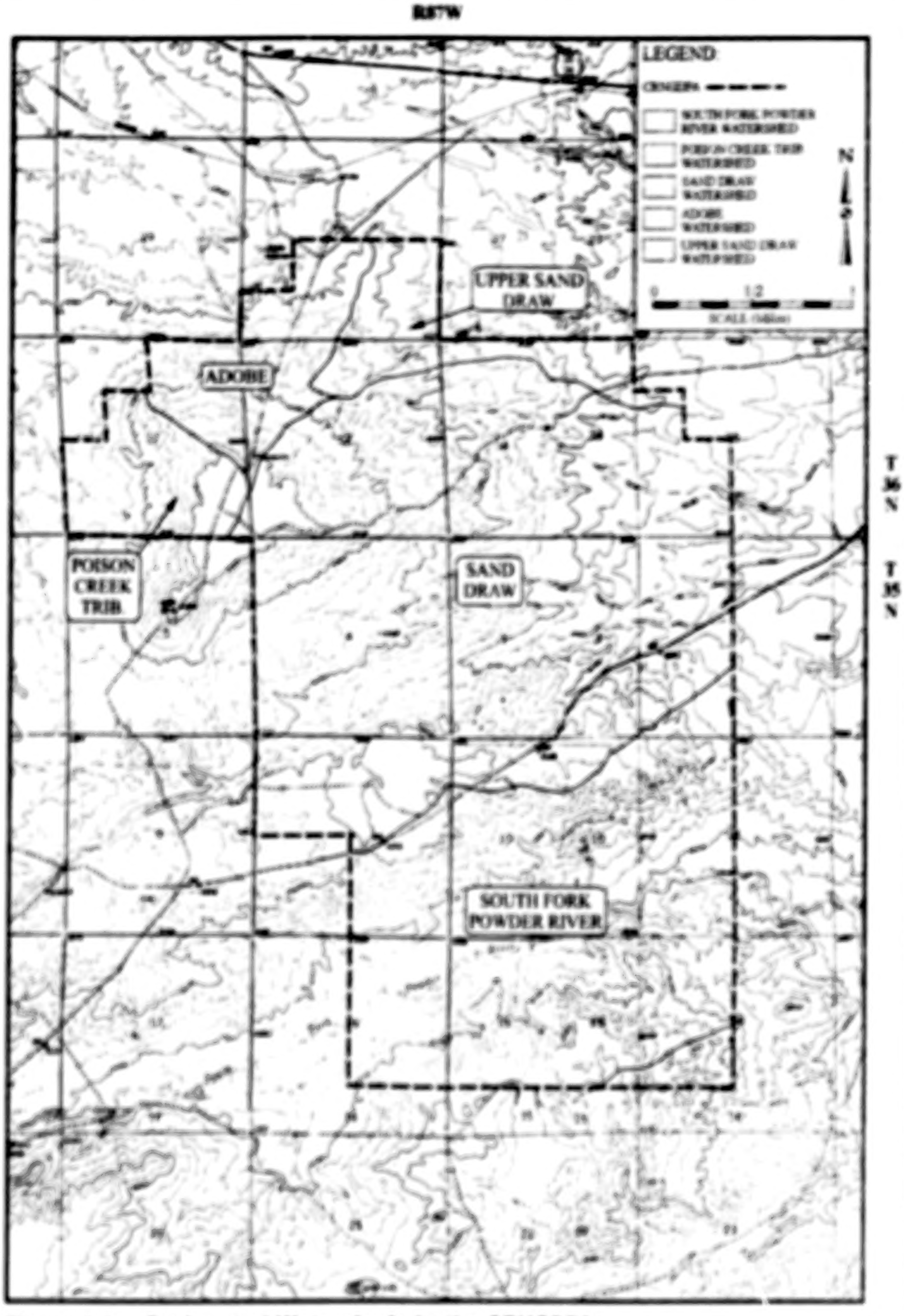


Figure 3.2 Designated Watersheds in the CRNGDPA

3. Sand Draw, containing approximately 3,135 acres or 49.90% of CRNGDPA.

4. South Fork of Powder River, containing approximately 1,951 acres or 31.06% of CRNGDPA.

The bulk of the project area is located within the Sand Draw and South Fork of the Powder River watersheds (see Figure 3.2). As their names imply, these watersheds are drained primarily by ephemeral drainages of both Sand Draw and the South Fork of the Powder River. The northwestern corner of the CRNGDPA is included within the Adobe Reservoir and Poison Creek Tributary watersheds, which are drained by ephemeral drainages of Poison Creek. All of these drainages are intermittent in nature and normally flow only during periods of spring runoff and/or localized periods of heavy rainfall. Runoff generated in the Sand Draw and South Fork of the Powder River watersheds would flow to the east/northeast out of the project area while runoff generated in the Adobe Reservoir and Poison Creek Tributary watersheds would flow to the west out of the project area. All four watersheds drain into the Missouri River system, which ultimately flows into the Gulf of Mexico via the Mississippi River.

Approximately 407.38 acres within the CRNGDPA are located outside of the boundaries of the four designated watersheds depicted in Figure 3.2. Of the 407.38 acres which are outside of these designated watersheds, 337 acres (5.36%) were included in the Upper Sand Draw watershed analyzed in the Cave Gulch-Bullfrog-Waltman Natural Gas Project EIS (USDI-BLM 1997). The remaining 70.38 acres represents 1.12% of the overall acreage within the CRNGDPA; however, this acreage is located in fringe areas adjacent to the exterior boundaries of the CRNGDPA which would probably not be impacted by surface disturbing activities associated with the proposed action.

Topographic maps of the CRNGDPA reveal that 5 separate stock reservoirs (surface impoundments) existed within the project area at the time the area was originally mapped by the U.S. Geological Survey (ca. 1952). A review of aerial photographs taken of the overall project area on June 7, 1996 revealed that only 2 of these 5 stock reservoirs were holding water at the time of the overflight. Both reservoirs were constructed on the same second order ephemeral tributary drainage of Sand Draw and are located as follows:

1) SW¼SW¼NE¼ of Section 34, Township 36 North, Range 87 West; and

2) NE¼SE¼SW¼ of Section 35, Township 36 North, Range 87 West.

Subsequent inventories of these reservoirs (spring 1998) indicated that these impoundments have silted in over the years and were not holding water at the time of the field inspection(s).

On February 24, 1998 the Wyoming State Engineer's Office conducted a computerized search of their database in an attempt to identify valid existing water rights within the CRNGDPA. Four (4) unadjudicated water rights were identified as a result of this search, 2 of which were for stock reservoirs as follows:

- Permit Number P4676S issued to C.A. Fenton on August 29, 1962 for a 1.80 acre-foot surface impoundment on Aspirin Draw for stock watering purposes and located in the NE¼NE¼ of Section 16, Township 35 North, Range 87 West, and

- Permit Number P6003S issued to Rochelle Sheep Company on June 29, 1967 for a 1.66 acre-foot surface impoundment on Muddy Draw for stock watering purposes and located in the SE¼NW¼ of Section 34, Township 36 North, Range 87 West.

3.6.2 Sub-Surface Hydrology

As indicated in Section 3.5, the primary, near-surface, fresh water aquifer within the CRNGDPA is the Eocene Wind River Formation. The lower portion of the Wind River Formation consists principally of poorly bedded siltstone interbedded with lenticular sandstones, while the upper portion of the formation consists of medium to coarse grained arkosic sandstone and conglomerate with minor amounts of lenticular siltstone, claystone, and carbonaceous shales (Crist and Lowry 1972). Within the CRNGDPA, the Wind River Formation extends from the surface to a depth of approximately 2,000 feet. Information compiled by Crist and Lowry (1972) concerning water bearing properties of the Wind River Formation in Natrona County indicate that water wells are typically drilled into the Wind River Formation for stock and/or domestic purposes to depths less than 500 feet, with drilling operations suspended once the required yield has been obtained. Most of these water wells are pumped and yields typically do not exceed 25 gallons per minute (gpm). A review of existing ground water rights within the CRNGDPA by Office of the Wyoming State Engineer on both November 18, 1997 and again on February 24, 1998 indicated that water well permits have been granted within the project area as follows:

- NE¼SW¼ of Section 3, Township 35 North, Range 87 West. Twidale #1, Permit #P91883W issued to Russell Forgey Construction Company and the Wyoming Board of Land Commissioners, Priority Date 06/04/93. Well drilled to a total depth of 380 feet, yield 5 gpm.

- SW¼NE¼ of Section 33, Township 36 North, Range 87 West. Side Hill #1, Permit #P3461W issued to Deer Creek Ranch, Inc. and the Wyoming Game & Fish Commission, Priority Date 11/07/69. Well drilled to a total depth of 150 feet, yield 10 gpm.

- SE¼NW¼ of Section 3, Township 35 North, Range 87 West. Cooper Reservoir Unit #1 Water Supply Well, Permit #UW-107836 issued to Intoil, Inc., Priority Date 10/9/97. Well drilled to a total depth of 550 feet, yield 25 gpm.

3.7 RANGE

The 2,640.28 acres of public land included within the CRNGDPA encompass portions of three separate grazing allotments, each of which are currently subject to a separate grazing lease. Table 3.4

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provides general information concerning each grazing allotment within the CRNGDPA including allotment name and number, grazing lessee, lease number, total acres, and total Animal Unit Months (AUM's).

Table 3.4

Grazing Allotments in the CRNGDPA

Allotment Name	Allotment Number	Grazing Lessee(s)	Grazing Lease Number	Total Acres in CRNGDPA	Total AUM's in CRNGDPA
South Hiland	10030	Deer Creek Ranch, Inc	496071	1,280.28	149.16
Skyline	10145	David Mackenzie	496179	960.00	154.60
Springsteen	20520	George & Penny McKim	496412	400.00	49.52
Total				**2,640.28**	**353.28**

Table 3.5 provides more specific information concerning each of the three grazing leases including the legal description of each lease, the number of acres within each lease parcel, and the acres per AUM.

Table 3.5

Description of Grazing Leases on Public Lands within the CRNGDPA

Grazing Lessee	Lease Number	Legal Location of Grazing Lease				# Acres	Acres/ AUM
		Quarter	Section	Township	Range		
Deer Creek Ranch, Inc	496071	W½	2	35 North	87 West	320.28	5.50
		N½	9	35 North	87 West	320.00	6.15
		N½	10	35 North	87 West	320.00	6.15
		NW¼	11	35 North	87 West	160.00	8.00
		SE¼	28	36 North	87 West	160.00	8.47
David Mackenzie	496179	SE¼	9	35 North	87 West	160.00	6.27
		S½	10	35 North	87 West	320.00	6.27
		N½, N½S½	15	35 North	87 West	480.00	6.15
George & Penny McKim	496412	SW¼	11	35 North	87 West	160.00	7.06
		NW¼, N½SW¼	14	35 North	87 West	240.00	9.01

On the average, the public rangelands within the project area have a carrying capacity of 7.5 acres per AUM for domestic livestock and are generally utilized as year-round pasture by the permittees. We may assume that similar, state and/or privately-owned, rangelands within the project area would also have a carrying capacity of approximately 7.5 AUM's and that grazing practices would be similar to those currently being utilized on public lands. Range improvements within the CRNGDPA consist primarily of cross-fencing along property and/or allotment boundaries, as well as the stock reservoirs and water wells identified in Section 3.6.2 (above).

Several species of noxious weeds have become established on disturbed sites throughout Wyoming and the CRNGDPA. Some of the more common weed species include Canada thistle, musk thistle, Russian knapweed, spotted knapweed, and leafy spurge.

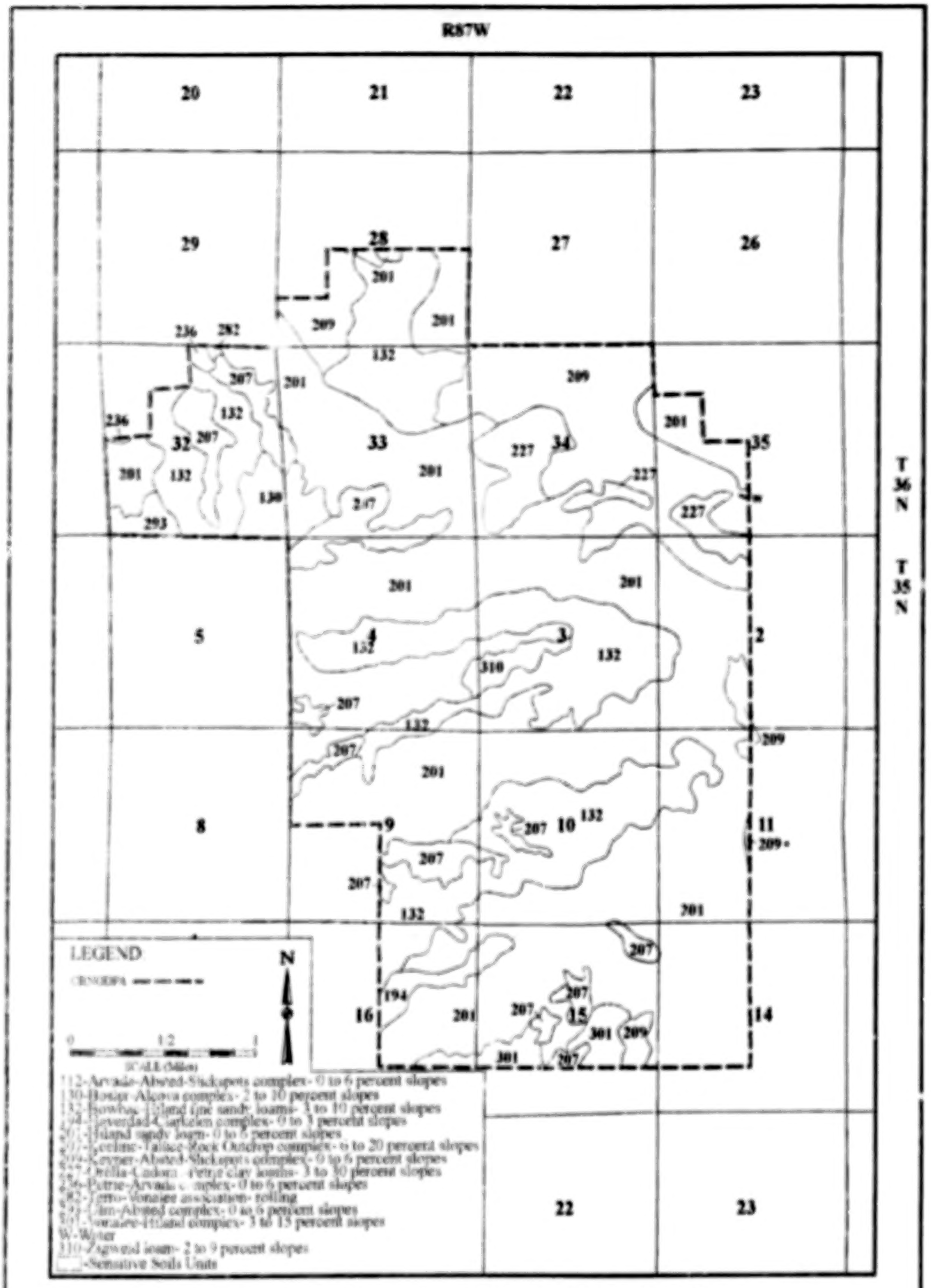
3.8 SOILS

The Wind River Basin exhibits a wide range of soils which are directly associated with the topography. Variations in soils are due to the differing origins of parent materials, different climatic conditions, and the effects of different types of vegetation. In this regard, a Third Order Soils Inventory of Natrona County has been conducted by the U.S. Department of Agriculture, Soil Conservation Service. As a result of this inventory, soils within the project area have been mapped and classified (see Figure 3.3). Table 3.6 provides information concerning those soil mapping units within the CRNGDPA, total acres, the percentage of total acres, and sensitivity of these soils. Table 3.7 provides a summary of the physical characteristics of individual soils within each of these soil mapping units.

Table 3.6

Soil Mapping Units within the CRNGDPA

Map Unit	Name of Soil Mapping Unit	# Acres	% of Area	Sensitive Soil
112	Arvada-Absted-Slickspots complex, 0-6% slopes	20	0.32	No
130	Bosler-Alcova complex, 2 to 10% slopes	98	1.56	Yes
132	Bowbac-Hiland fine sandy loams, 3 to 10% slopes	1,364	21.71	No
194	Haverdad-Clarkelen complex, 0 to 3% slopes	60	0.96	No
201	Hiland sandy loam, 0 to 6% slopes	3,267	52.00	No
207	Keeline-Taluce-Rock Outcrop complex, 6 to 20% slopes	401	6.38	No
209	Keyner-Absted-Slickspots complex, 0 to 6% slopes	695	11.06	Yes
227	Orella-Cadoma-Petrie clay loams, 3 to 30% slopes	199	3.17	Yes
236	Petrie-Arvada complex, 0 to 6% slopes	11	0.18	No
282	Terro-Vonalee association, 3 to 15% slopes	3	0.05	Yes
293	Ulm-Absted complex, 0 to 6% slopes	36	0.57	No
301	Vonalee-Hiland complex, 3 to 15% slopes	81	1.29	Yes
310	Zigweid loam, 2 to 9% slopes	47	0.75	No


R87W
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15
14
22
23
201
209
132
207
236
282
130
293
227
310
194
301
LEGEND
CRNGDPA
N
0
1/2
1
SCALE (Miles)
112-Arvada-Absted-Slickspots complex- 0 to 6 percent slopes
130-Bosler-Alcova complex- 2 to 10 percent slopes
132-Bowbac-Hiland fine sandy loams- 3 to 10 percent slopes
194-Deverdad-Clarkelen complex- 0 to 3 percent slopes
201-Hiland sandy loam- 0 to 6 percent slopes
207-Lecline-Tallace-Rock Outcrop complex- 6 to 20 percent slopes
209-Keyner-Absted-Slickspots complex- 0 to 6 percent slopes
227-Orella-Cadoma-Petrie clay loams- 3 to 30 percent slopes
236-Petrie-Arvada complex- 0 to 6 percent slopes
282-Tenno-Vonalee association- rolling
293-Ulm-Absted complex- 0 to 6 percent slopes
301-Vonalee-Hiland complex- 3 to 15 percent slopes
W-Water
310-Zigweid loam- 2 to 9 percent slopes
-Sensitive Soils Units

Figure 3.3 Soils Units as Shown in relation to the CRNGDPA

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3.9 VISUAL RESOURCES

The northern portion of the CRNGDPA falls within a 3 mile buffer zone established along U.S. Highway 20-26 which was included within Visual Resource Management (VRM) Class III by the Platte River Resource Area (PRRA) Office in their *Oil & Gas Environmental Assessment* dated March, 1982. Under this VRM class, changes in the basic elements (form, line, color, or texture) may be evident in the characteristic landscape. However, the changes should remain subordinate to the visual strength of the existing (land) character. The natural landscape in this 3-mile corridor along either side of U.S. Highway 20-26 has been subjected to some extensive cultural modifications, all of which contribute to the degradation of the scenic values in the area directly north of the CRNGDPA. These cultural modifications include, but are not limited to, the following facilities:

1. Above-ground power transmission lines traversing the overall project area and extending to the north across U.S. Highway 20-26 directly to the west of the community of Waltman.

2. An existing KN Energy compressor station located in the SE¼NE¼NE¼ of Section 36, T36N, R87W, approximately 1 mile south of the community of Waltman (east side of Natrona County Road 212).

3. An existing rural store and junkyard located in the S½SW¼ of Section 19, T36N, R86W at the community of Waltman (north side of U.S. Highway 20-26).

4. Ranch outbuildings and commercial facilities including an industrial water well and a drilling rig stack yard located approximately 1/2 mile south of the community of Waltman in the NE¼SW¼ of Section 30, T36N, R86W.

5. Ranch outbuildings located approximately 2 miles west of the community of Waltman in the SW¼ of Section 23, T36N, R87W.

6. A State of Wyoming rest stop located approximately 2 miles west of the community of Waltman in the SW¼ of Section 23, T36N, R87W (north side of U.S. Highway 20-26).

7. An industrial water well with associated water storage tanks and a tank truck parking facility located in the NE¼NE¼ of Section 30, T36N, R86W approximately 3/4 mile east of the community of Waltman (north side of U.S. Highway 20-26).

8. Oil/gas well facilities within 1 mile of U.S. Highway 20-26 which are visible to travelers thereon, including 4 producing gas wells and 2 wells which have just recently been drilled as follows:

    a) Waltman Unit #6: SE¼NW¼ of Section 19, T36N, R86W (producing gas well);

    b) Waltman Unit #21-19: SW¼SW¼ of Section 19, T36N, R86W (producing gas well);

    c) Harris #1: SE¼SW¼ of Section 19, T36N, R86W (waiting on completion);

d) Waltman Unit #4: NW¼NE¼ of Section 24, T36N, R87W (producing gas well);

e) Waltman Unit #19: NE¼SE¼ of Section 24, T36N, R87W (producing gas well); and

f) Horstman #14-21: SW¼SW¼ of Section 24, T36N, R87W (drilled and abandoned, but not yet reclaimed).

The remaining portions of the CRNGDPA which are outside of the 3 mile corridor along U.S. Highway 20-26 fall within VRM Class IV. Under this VRM Class, changes may subordinate the original composition and character of the landscape, but must reflect what could be a natural occurrence within the characteristic landscape (USDI-BLM 1982). Cultural modifications to the existing landscape along Natrona County Road 212 include many of the facilities listed above, in conjunction with existing development within the CRU (refer to Table 3.3 and Figure 1.2).

3.10 WILDLIFE

The differing climatic conditions described in Section 3.2 tend to produce differing floral and faunal communities, referred to by Cary (1917) as life zones. Of the life zones he described for Wyoming, all five (5) can be found in the Wind River Basin. The vertical boundaries of these life zones are determined by factors such as latitude, base level, and slope exposure in the northern regions of North America, which have a lower base level due to higher latitude. In situations where altitude changes are gradual (e.g., the open plains) changes from one life zone to another are scarcely noticeable. In localities where plant and animal surveys have been performed, a marked dominance of characteristic species of a particular zone often defines the zonal position while nearby equal representation, or a marked absence, of a species peculiar to two (2) adjoining zones is indicative of an intermediate position, or the approximate boundary thereof (USDA-SCS 1974).

These five (5) life zones range from the Upper Sonoran, at the lowest and warmest elevations, through the Transition, Canadian, and Hudsonian to the Arctic-Alpine zone on the crests of the highest mountain ranges. It should be noted that elevation ranges for these zones are very flexible and the ranges given are general and should not be considered absolute. In this regard, the general project area appears to occupy the boundary between the Upper Sonoran and Transition Life Zones as described by Cary (1917) for Wyoming (USDA-SCS 1974).

3.10.1 Upper Sonoran Life Zone

The Upper Sonoran Life Zone covers a large expanse of the relatively low altitude country in the arid Wind River Basin at elevations generally below 5,500 feet. Vegetation includes different species of saltbush, greasewood (*Sarcobatus vermiculatus*), different species of rabbitbrush, sagebrush, including spiny sagebrush (*Artemisia spinescens*), Plains yucca (*Yucca glauca*), and different species of prickly pear cactus, with skunk bush (*Schmaltzia trilobata*) and different species of juniper on the bluffs, and broad-leafed cottonwood (*Populus occidentalis*), buffaloberry (*Lepargyrca agrentea*), flowering currant (*Ribes longiflorum*) and wolfberry (*Symphoricarpos occidentalis*) along the streams and drainages (USDA-SCS 1974).

Specific vegetation observed within the project area which is characteristic of this life zone and the soils identified therein include greasewood, rabbitbrush, sagebrush, prickly-pear cactus, Indian ricegrass, blue grama grass, western wheatgrass, and prairie junegrass.

The Upper Sonoran zone within the project area is weak in nature in that it exhibits a relatively small number of the characteristic life zone species of mammals and birds. Mammalian species which exemplify this zone within the Wind River Basin, and which would be expected to occur within the specific project area include the Pronghorn antelope *(Antilocapra americana)*, Colorado chipmunk (*Eutamias quadrivittatus*), Northern grasshopper mouse (*Onchomys leucogaster articeps*), kangaroo rat (*Dipodomys ordii luteolus*), desert cottontail (*Sylvilagus auduboni*), spotted skunk (*Spilogale putoris*) and California bat (*Myotis californicus californicus*).

3.10.2 Transition Life Zone

The transition life zone exists in the Wind River Basin generally above 5,500 feet and includes vast interior sagebrush plains, watersheds, plateaus and high altitude basins. This zone is marked along its upper boundary where sage dominated slopes give way to characteristic vegetation of the Canadian zone (i.e., aspen and conifer forests). The lower limit of this zone is indicated by either the absence, or a smaller number, of Upper Sonoran species.

Characteristic vegetation of the Transition zone includes sagebrush dispersed widely throughout the zone, and a variety of Douglas fir (*Pseudotsuga mucronata*) and Rocky Mountain white pine (*Pinus murrayana*) in higher mountain areas. On streams at the base of the mountains the zone is marked by narrow leafed cottonwood, diamond willow (*Salix mackenziana*), Rocky Mountain birch (*Betula fontinalis*), wild gooseberry (*Grossularia inermis*) and currant. Foothills and lower mountain slopes are occupied by Rocky Mountain and creeping junipers (*Juniperus sabina*), bebb willow (*Salix bebbiana*), mountain mahogany, rabbitbrush and others (USDA-SCS 1974).

Specific vegetation observed within the project area which is characteristic of this life zone and the soils identified therein include rabbitbrush, sagebrush, Indian ricegrass, blue grama grass, western wheatgrass, and prairie junegrass. Representative species of birds for the Transition life zone include sage grouse (*Centrocercus urophasianus*), sharp-shinned hawk (*Accipiter striatus*), saw-whet owl (*Aegolis acadicus*), blackbilled magpie (*Pica pica*), mountain song sparrow (*Melospiza melodia montana*) and the veery (*Hylocichla fuscescens*). Mammals include Mule deer *(Odocoileus hemionus)*, Black Hills red squirrel (*Tamiasciurus hudsonicus dakotensis*), Wyoming (*(Citellus richardsoni elegans*) and Uinta (*(Citellus armatus*) ground squirrels, western jumping mouse (*Zapus princeps)*, white-tailed jack rabbit (*Lepus townsendi campanius*) and others (USDA-SCS 1974).

3.10.3 Economically Important Wildlife Species

Wildlife species of economic importance (game species) which are found within the proposed project area are listed below:

- Pronghorn antelope *(Antilocapra americana)*

  Historically found throughout the sagebrush upland areas of the Upper Sonoran and Transition Life Zones throughout the Wind River Basin.

- Mule deer *(Odocoileus hemionus)*

  Found primarily in the sagebrush upland areas of the Transition Life Zone. Seasonal distributions may vary from the Hudsonian Life Zone (timberline) to the Upper Sonoran Life Zone (semi-arid lowlands).

- Sage grouse *(Centrocercus urophasianus)*

  Occurs widely throughout sagebrush upland areas of the Transition Life Zone within the Wind River Basin.

Antelope and mule deer populations residing in that portion of the project area located on the east side of Natrona County Road 212 (Gas Hills Road) are classified within the Rattlesnake Herd Unit, which includes antelope hunt areas 70, 71, and 72 and deer hunt areas 88 and 89. This portion of the proposed project area is specifically included within antelope hunt area 72 and deer hunt area 89. Herd objectives for both antelope and deer in the Rattlesnake Herd Unit are 12,000 and 5,500 post hunt animals, respectively (WGFD 1997a). Antelope and mule deer populations residing in that portion of the project area located on the west side of Natrona County Road 212 (Gas Hills Road) are classified within the Beaver Rim Herd Unit, which includes antelope hunt areas 65-69, 74, and 106 and deer hunt area 90. This portion of the proposed project area is specifically included within antelope hunt area 74 and deer hunt area 90. Herd objectives for both antelope and deer in the Beaver Rim Herd Unit are 25,000 and 2,600 post hunt animals, respectively (WGFD 1997b). Generally speaking, antelope and deer numbers in both herd units are well below objective levels due to a combination of high animal mortality (particularly for antelope) during the winter of 1992/93 and the cumulative impacts of sustained drought on population recruitment. The inability of these animal populations to rebound from winter losses during 1992/93 has resulted in license reductions and a concomitant reduction in hunter opportunity (WGFD 1997a, 1997b).

Sage grouse populations in this area of Wyoming remain well below both historic and WGFD desired levels due to low recruitment resulting from poor nesting conditions over the past 7 years (Patterson 1997). The project area is not known to contain active leks, however, there have been no intensive inventories conducted to identify sage grouse strutting activity in the area. While observations of grouse in the area are limited (WGFD 1998), the presence of droppings on ridge tops throughout the CRU would indicate that the area does receive use by grouse at some point during the year.

In addition to the game species mentioned above, this area also supports a variety of habitats for non-game vertebrates including numerous species of passerine birds and small mammals generally identified in Sections 3.10.1 and 3.10.2. These small birds and mammals form a prey base for numerous avian and terrestrial predators including, but not limited to, coyotes, badgers, mountain lions, great horned owls and plains raptors including golden eagles, ferruginous and red-tailed hawks.

3.10.4 Raptors

In the spring of 1996, BLM personnel conducted several inventories within the CRU in order to determine the extent of raptor nesting activity therein. These inventories were conducted in response to oil/gas exploration and development activities proposed by both Intoil, Inc. and Prima Oil & Gas Company in and adjacent to the CRU. Seven (7) nest structures were identified in or adjacent to the CRU as a result of these surveys. A follow-up inventory of the CRU was conducted in 1997 by Anderson Environmental Consulting (AEC) to determine nesting activity on the 7 nests previously identified by BLM in 1996. The AEC inventory also surveyed a one-half mile buffer zone adjacent to the CRU boundary in anticipation of additional exploration and development therein by Intoil.

In addition to the BLM and AEC nesting inventories referenced above, additional inventories of raptor nesting activity in the general area have been conduced by Hayden-Wing Associates (HWA) in conjunction with oil/gas exploration and development activity proposed in the Cave Gulch-Bullfrog-Waltman Natural Gas Development Project Area (CGBWNGDPA). The HWA inventories have been conducted annually since 1994 and currently encompass a 273 square mile survey area which includes the northern portion of the CRNGDPA. Raptor nests discovered by HWA within the Greater cave Gulch Raptor Analysis Area (GRAA) in conjunction with these inventories were identified by a numbering system starting with nest number 1 and ending in 1997 with nest number 194. Nests which were inventoried by AEC in 1997 and which had not been previously identified by HWA were assigned an identification number beginning with nest number 195. Table 3.8 summarizes the results of both the 1996 and 1997 inventories of raptor nesting activity in the CRU and surrounding areas with the approximate location of those raptor nests identified in Table 3.8 and depicted in Figure 3.4.

3.10.5 Special Status Wildlife Species

3.10.5.1 Threatened and Endangered Species

Special status wildlife species include those species which are in danger of extinction due to drastic population declines and which have subsequently been listed as threatened or endangered (T/E) pursuant to the *Endangered Species Act* (ESA) of 1973 (as amended). Currently listed T/E species which may occur within the project area include:

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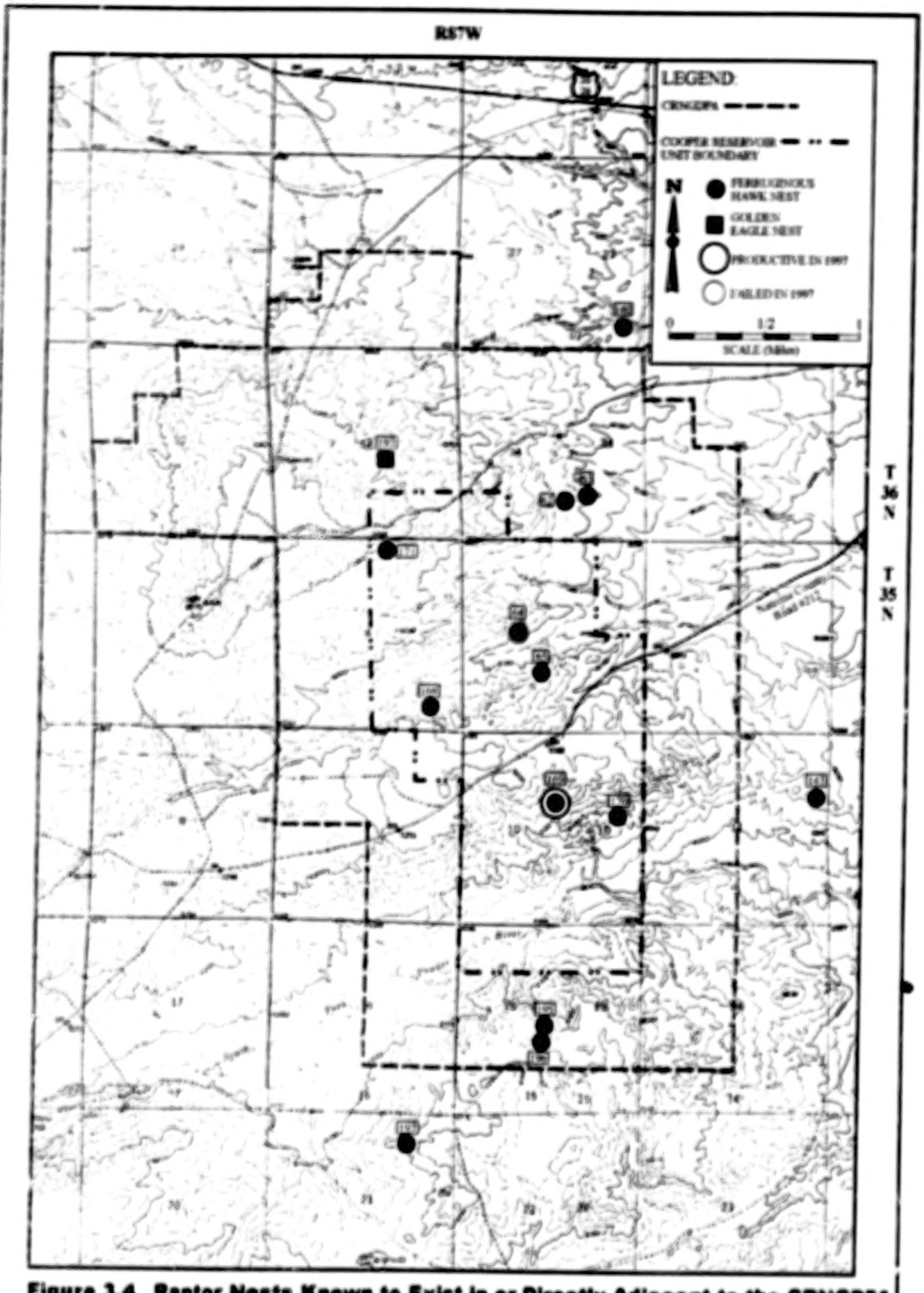

Figure 3.4 Raptor Nests Known to Exist in or Directly Adjacent to the CRNGDPA

Table 3.8

1996/97 Raptor Nesting Activity In or Adjacent to the CRNGDPA

Nest Number	Raptor Species	Nest Condition	Legal Location of Nest Structure				1996 Status	1997 Status
			Quarter	Section	Township	Range		
64	FH[1]	Excellent	SE¼SE¼NW¼	3	35 North	87 West	Inactive	Failed
65	FH	Excellent	SE¼NE¼SW¼	3	35 North	87 West	Inactive	Inactive
168	FH	Poor	SW¼SE¼SE¼	4	35 North	87 West	Inactive	Inactive
171	FH	Poor	NW¼NW¼NE¼	4	35 North	87 West	Inactive	Inactive
169	FH	Excellent	NE¼SE¼NW¼	10	35 North	87 West	Inactive	Active
170	FH	Excellent	SW¼SE¼NE¼	10	35 North	87 West	Active	Inactive
143	FH	Poor	NE¼SE¼NE¼	11	35 North	87 West	Inactive	Inactive
195	FH	Poor	NE¼NE¼SW¼	15	35 North	87 West	?	Inactive
196	FH	Poor	NE¼NE¼SW¼	15	35 North	87 West	?	Inactive
197	FH	Fair	SE¼NW¼NE¼	21	35 North	87 West	?	Inactive
140	FH	Fair	NE¼SE¼SE¼	27	36 North	87 West	Inactive	Inactive
192	GE[2]	Excellent	NE¼NW¼SE¼	33	36 North	87 West	Active	Active[3]
62	FH	Poor	NE¼SW¼SE¼	34	36 North	87 West	Inactive	Inactive
63	FH	Fair	SE¼NW¼SE¼	34	36 North	87 West	Inactive	Inactive

Sources: AEC 1997, HWA 1996, HWA 1997

1. FH = Ferruginous hawk.
2. GE = Golden eagle.
3. Nest was occupied by a pair of common ravens in 1997.

- **Bald eagle** *(Haliaeetus leucocephalus)*

  Migrant through the area during the fall and spring migrational periods, seasonal resident during the winter months along the North Platte River.

  The primary habitat for bald eagles migrating through or wintering in central Wyoming would include riparian area(s) along the North Platte River in Natrona County and both the Big and Little Wind Rivers in Fremont County, which provide roosting and perching areas for eagles foraging along the river course and their adjacent uplands. Roosting areas for bald eagles are also known to occur on the west end of Casper Mountain (Jackson Canyon) and on Pine Mountain (both of which are located in Natrona County).

- **Black-footed ferret** (*Mustela nigripes*)

  Potential resident in prairie dog *(Cynomys sp.)* colonies.

3.10.5.2 Candidate Species

Special status wildlife species also include those candidate species which have been proposed for listing as threatened or endangered (C1 species), and those candidate species which are considered "at risk" but which generally lack sufficient biological (population) data to warrant listing under the ESA (C2 species). While these candidate species warrant concern due to general population declines, they do not receive statutory protection under the ESA. Candidate species (C1) which may occur within the project area include:

- **Swift fox** (*Vulpes nigripes*)

  The swift fox historically inhabited short and mid-grass prairies throughout the northern Great Plains from the foothills of the Rocky Mountains across the prairies of the Dakotas, Nebraska, Oklahoma, and Texas. While the swift fox was once common throughout its range, they now occur only on the remnants of shortgrass prairie (Clark and Stromberg 1987). The species is most common in areas with relatively flat to gently rolling topography in eastern Wyoming and portions of northeastern Colorado (Fitzgerald *et al* 1994).

  Declines in swift fox populations have been primarily attributed to the indiscriminate use of predator control methods aimed primarily at wolves in the waning years of the nineteenth century and later at coyotes during the first half of the twentieth century. A decline in the use of indiscriminate predator control practices (e.g., poisons such as 1080 and trapping) have resulted in an apparent increase in swift fox populations throughout the west. In this regard, investigations by Woolley *et al* (1995) suggest that the swift fox is more widely distributed in Wyoming than previously thought.

- **Mountain plover** (*Charadrius montanus*)

  The mountain plover is generally considered an associate of the shortgrass prairie, which is dominated by blue grama (*Bouteloua gracilis*) and buffalo grass (*Buchloe dactyloides*)(Graul 1975). The species breeds across the western Great Plains and at isolated locales in western Colorado, Wyoming and New Mexico (Leachman and Osmundson 1990). Between 1966 and 1991, continental populations of the mountain plover declined by 63% (Knopf 1994), with the Pawnee National Grassland in Weld County, Colorado being both the historic and current breeding stronghold of this aridland member of the family Charadriidae (Graul and Webster 1976). A second major breeding population of mountain plovers is currently located on the Charles M. Russell National Wildlife Refuge in Phillips, Montana (Knopf and Miller 1994).

In August of 1997 a search was made of both the WGFD Wildlife Observation System (WOS) and the Wyoming Natural Diversity Database (WNDDB) records to determine if any sightings of either swift fox or mountain plover had been recorded within a 6,084 square mile area centered on the CRNGDPA. The search area included Townships 30 through 42 North and Ranges 79 through 91 West, inclusive. No sightings of either species were recorded in the WNDD for the survey area. Recorded observations in the WOS database included one swift fox sighting in Township 36 North,

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Range 83 West in May of 1988; however, a specific legal location for the sighting was not given. Seven sightings of mountain plover in the survey area were recorded between April 21, 1981 and June 15, 1994 (WGFD 1997c, WNDDB 1997). One additional mountain plover sighting was made in conjunction with the Cave Gulch-Bullfrog-Waltman Natural Gas Development Project on July 2, 1997 (Fitzgerald 1998). The legal locations of these mountain plover sightings are provided in Table 3.9.

Table 3.9

Recorded Mountain Plover Observations in the 6,084 mi² Survey Area

Date of Observation	Legal Location of Plover Observations				Number Observed	Observed Habitat Type
	Quarter	Section	Township	Range		
04/21/1981	?	?	34 North	86 West	3	Sagebrush-Grassland
06/14/1984	?	14	30 North	85 West	1	Not Recorded
06/25/1984	?	36	35 North	86 West	1	Sagebrush-Grassland
09/14/1987	SE¼NW¼	23	31 North	81 West	1	Saltbush
07/05/1990	NW¼SE¼	30	30 North	85 West	1	Shoreline
06/15/1994	SE¼SE¼	36	38 North	91 West	1	Not Recorded
06/15/1994	SW¼	24	40 North	90 West	1	Not Recorded
07/02/1997	NW¼NW¼	21	37 North	86 West	1	Not Recorded

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

This chapter describes the environmental consequences of implementing either the Proposed Action or No Action alternative. Since implementation of the No Action alternative would result in an uncertain level of future activity within the CRNGDPA, this alternative is not specifically addressed for each individual resource (see Sections 2.4 and 4.10).

Analysis of each resource will include a discussion of the anticipated environmental consequences (impacts) to the human environment associated with the Proposed Action. Cumulative impacts will also be discussed for each resource and the discussion of cumulative impacts will address trends in existing resource uses within the project area that are likely to continue into the reasonably foreseeable future. Discussion of some resources will include descriptions of mitigation measures which are suggested to reduce the environmental impacts associated with the Proposed Action. The Operator has committed to implement all reasonable mitigation measures discussed in this chapter and summarized in Chapter 5.0.

4.2 AIR QUALITY

4.2.1 Introduction

Air quality impacts are limited by regulations, standards, and implementation plans established under the Federal Clean Air Act and State of Wyoming laws, as administered by WDEQ/AQD. Under FLPMA and the Clean Air Act, the BLM can not conduct or authorize any activity which does not conform to all applicable local, state, tribal or Federal air quality laws, statutes, regulations, standards or implementation plans. An extensive air quality impact assessment was prepared (as detailed in "Cooper Reservoir Technical Support Document: Cumulative Air Quality Impact Analysis."). A copy of the detailed report is available for review at the BLM PRRA, and is incorporated into this document by reference (TRC 1998). This analysis was based on "reasonable, but conservative" assumptions regarding:

1) the amount of additional oil/gas exploration and development in the CRNGDPA;

2) the equipment necessary to produce the resource to its maximum capacity;

3) proposed well spacing, and

4) source locations.

This "reasonable, but conservative" emission scenario represents an upper bound which would not be exceeded. For example, review of current production activities in the area suggests that the level of assumed air emissions and impacts would not be reached. Thus the impacts projected in this report should be viewed as a conservative "upper bound" estimate of potential air quality effects which are not likely to occur. It is important to note that before development could occur, the WDEQ/AQD requires a very specific air quality pre-construction permit review in order to examine emissions from proposed pollutant sources prior to their construction (i.e., compressor engines or gas plants, etc.). WDEQ/AQD would examine project specific air pollutant emission and potential air quality effects, per requirements of both Wyoming and Federal air quality standards and regulations, and determine which facilities must obtain air pollutant emission permits. For example, individual well sites could be permitted following a limited start-up period, as required by the WDEQ/AQD. Thus as development occurs, site specific air quality analysis would be performed (in addition to this air quality impact assessment), and emission control measures may be required in order to ensure protection of air quality resources.

4.2.2 Significance Criteria

The significance criteria for air quality include both state and federally enforced legal requirements to ensure that ambient air pollutant concentrations remain below specified levels. These include the Wyoming and National Ambient Air Quality Standards, and the Prevention of Significant Deterioration (PSD) Class I and Class II increments (which limit specific air pollutant concentration increases above a baseline value in specific areas), as listed in Table 3.1. Where legal significance criteria have not been established, a review of current scientific knowledge and administrative policies has been conducted.

4.2.3 Direct and Indirect Impacts

4.2.3.1 Emissions Inventory

Near-field air quality impact modeling was used to predict maximum potential concentrations in the vicinity of the emission sources for comparison with applicable air quality standards. This modeling was performed to quantify "reasonable, but conservative" potential impacts from particulate and SO_2 emissions during construction, and CO, NO_x (oxides of nitrogen), VOC (volatile organic compounds, known as ozone precursors), and HAP (hazardous air pollutants) emissions during production. Using the Cooper Reservoir well site design for minimum well site spacing and proposed compression, a representative well field "patch" was used to determine a realistic geometric layout. This "patch" included a group of 9 simultaneously producing well sites, and an individual 5,000 hp compressor engine. The ISCST3 dispersion model was used with meteorological data collected at Casper and Lander, Wyoming, during 1991.

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Potential TSP and PM_{10} emissions from traffic on the unimproved lease road, resource road, and during well pad construction, were used to determine the maximum 24-hour TSP and PM_{10} concentrations, and the annual average PM_{10} concentration. These emissions are temporary (occur over a 5-day period) during construction and would occur in isolation without significantly affecting neighboring well sites. In computing potential TSP and PM_{10} impacts from particulate emissions due to well pad and resource road construction, it is assumed that a 50 per cent control efficiency would be achieved by applying water and/or chemical dust suppressants to minimize fugitive dust emissions.

4.2.3.2 Predicted Impacts

The total maximum potential concentrations at the public access receptors (including representative background values) would be nearly 66 $\mu g/m^3$ (PM_{10} 24-hour), 26 $\mu g/m^3$ (PM_{10} annual), and 135 $\mu g/m^3$ (TSP 24-hour). Therefore, both predicted short- and long-term particulate matter concentrations comply with all applicable Ambient Air Quality Standards, defined as 150 $\mu g/m^3$ (PM_{10} 24-hour), 50 $\mu g/m^3$ (PM_{10} annual), and 150 $\mu g/m^3$ (TSP 24-hour). It should be noted that particulate matter emissions associated with temporary construction activity do not consume PSD increments, therefore the particulate matter PSD increment regulations do not apply.

The predicted maximum 24-hour concentrations are likely to overestimate actual expected concentrations because they assume the maximum modeled concentration would coincide with the maximum measured background concentration. However, these two events would occur under very different meteorological conditions, and are not be expected to coincide.

The maximum short-term (3 and 24-hour) and long-term (annual) SO_2 emissions would occur due to the drilling engines used during the 13-day rig-up and drilling campaign. Although these emissions would be temporary, SO_2 concentrations were predicted for all applicable time periods. The total maximum modeled concentrations (including representative background values) would be nearly 119 $\mu g/m^3$ (3-hour), 43 $\mu g/m^3$ (24-hour), and 4 $\mu g/m^3$ (annual). Therefore, predicted SO_2 concentrations would comply with all applicable Wyoming Ambient Air Quality Standards, defined as 1,300 $\mu g/m^3$ (3-hour), 260 $\mu g/m^3$ (24-hour), and 60 $\mu g/m^3$ (annual), the Federal standards are less restrictive. Again, since the SO_2 emissions would be temporary, the SO_2 PSD increment regulations do not apply.

The maximum direct CO impacts predicted to occur from the compressor engines during the maximum well field production phase are nearly 195 $\mu g/m^3$ (1-hour) and 87 $\mu g/m^3$ (8-hour). When these values are added to the assumed background concentrations, total maximum CO impacts become nearly 3,695 $\mu g/m^3$ (1-hour) and 1,584 $\mu g/m^3$ (8-hour), demonstrating compliance with the applicable CO standards of 40,000 $\mu g/m^3$ (1-hour) and 10,000 $\mu g/m^3$ (8-hour).

Potential maximum NO_2 concentrations (predicted to occur during production) were determined by multiplying maximum modeled NO_x concentration values by 0.75, in accordance with standard Environmental Protection Agency (EPA) methodology (Federal Register 60:153, page 40469, dated August 9, 1995). A realistic "reasonable, but conservative" geometric layout of 9 simultaneously

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producing well sites, and an individual 5,000 hp compressor engine, were modeled to determine the potential for interaction of emissions (the greatest potential NO_2 impacts are those associated with the compressor station). The total maximum predicted NO_2 impact (including background) was nearly 21 $\mu g/m^3$, well below both the Wyoming and Federal NO_2 ambient air quality standards of 100 $\mu g/m^3$. In addition, the maximum modeled total NO_2 concentration of 21 $\mu g/m^3$ would not exceed the applicable PSD Class II increment of 25 $\mu g/m^3$ (no PSD Class I areas are likely to be affected by the proposed project). This comparison is not a comprehensive PSD Increment Consumption analysis (which is a regulatory inventory and compliance responsibility of the WDEQ/AQD, with EPA oversight), but is included in this impact assessment in order to indicate a potential level of significance.

In developing the NO_x emission inventory, it was assumed that each compressor engine would apply recent Best Available Control Technology (BACT) measures, reflecting at least 75 per cent control at an emission rate of 2 grams per horsepower-hour (g/hp-hr). Uncontrolled emissions are typically 9-25 g/hp-hr. This reflects the recent WDEQ/AQD BACT determinations for all engines with greater than 250 hp (Dailey 1996). The air quality impact assessment evaluated potential NO_x emission control measures for natural gas fired, internal combustion compressor engines. The evaluation did not rank or identify which technology is most applicable for the proposed compressors; the appropriate level of control would be determined as part of the air quality preconstruction permitting process required by the WDEQ/AQD. Possible NO_x emission control measures include:

- Nonselective Catalytic Reduction. This control technology is applicable to relatively new engines, and requires the installation of catalysts in the engine exhaust. The catalyst removes between 80 to 90 per cent of the uncontrolled NO_x emissions, for an operating emission rate of 1-5 g/hp-hr. Costs are approximately $110-180 per ton removed.

- Lean Combustion. This technology involves the increase of the air-to-fuel ratio to lower the peak combustion temperature, thus reducing the formation of NO_x (new engines and retrofit applications). The controls are between 80 to 90 percent efficient, for an operating emission rate of 1.5-4 g/hp-hr. Costs are $490-690 per ton removed.

- Selective Catalytic Reduction. This post-combustion control technology is only applicable to exhaust streams with significant oxygen content (a lean burn engine). The controls are between 80 to 90 percent efficient, for an operating emission rate of 1-2.5 g/hp-hr. Costs are $750-9,600 per ton removed.

Ozone is formed as a result of photochemical reactions involving ambient concentrations of VOC and NO_x. Because of the complicated photochemical reactions involved with the formation of ozone, a nomograph developed from the Reactive Plume Model was used to predict maximum potential ozone impacts (Scheffe 1988). This involves computing a potential VOC to NO_x emission ratio, and comparing this ratio (plus potential VOC emissions) to the nomograph. At the predicted ratio (3.0), the nomograph estimated maximum potential ozone concentrations of less than 0.02 parts per million (33 $\mu g/m^3$). Therefore, the total predicted ozone impact (including background) of 143 $\mu g/m^3$ would be below the Wyoming Ambient Air Quality Standard of 160 $\mu g/m^3$. The Federal standard is less restrictive. This predicted impact is very conservative since the nomograph was developed using meteorological conditions more conducive for forming ozone than would occur in the Cumulative Impact Study Area.

In addition, the potential emissions rates of several Hazardous Air Pollutants (HAP) from compression and well production were evaluated, including formaldehyde (approximately 0.14 tons per year) from the 5,000 hp compressor station, and n-hexane (0.27 tons per year), benzene (0.44 tons per year), toluene (0.10 tons per year), ethyl benzene (0.02 tons per year), and xylene (0.27 tons per year) from individual well dehydrators. Potential HAP impacts were predicted using the ISCST3 model and an 8-hour averaging time, then compared to a range of State Acceptable Ambient Concentration Levels (AACL). There are no applicable HAP ambient air quality standards. These data and thresholds are summarized in Table 4.1.

Table 4.1

Potential HAP Concentrations and Comparable State Acceptable Ambient Concentration Levels (µg/m^3)

Airborne Pollutant	Modeled 8-Hour Concentration	Range of State AACLs
formaldehyde	0.3	4.5- 71
n-hehane	11.6	1,800- 4,290
benzene	19.1	30- 714
toluene	4.4	1,870- 8,930
ethyl benzene	1.0	340-43,500
xylene	11.7	2,170- 4,400

Source: EPA 1997.

Note: These maximum predicted concentrations occur near (100 meters) the well sites and the compressor stations. As the distance from the wells and compressor station increases, the predicted concentrations decrease rapidly.

Long-term (70-year) exposures to suspected carcinogens (benzene and formaldehyde) emissions were calculated to estimate the latent cancer risk. These were calculated from EPA unit risk factors for carcinogenic constituents (EPA 1997). Two estimates of cancer risk were made; one that corresponds to a Most Likely Exposure (MLE) scenario, and one reflective of the Maximally Exposed Individual (MEI). The estimated cancer risks were adjusted to account for duration of exposure and time spent at home. In addition, there would be no further cumulative risk, since no residence would be affected by more than a group of 9 wells and a single compressor at the same time. Under the MLE scenario, the estimated cancer risks associated with long-term exposure to benzene and formaldehyde concentrations are 6e-08 and 4e-10, which are both below the le-06 threshold. The estimated total MLE cancer risk for the inhalation pathway (6e-08) is also less than

1e-06. Under the MEI scenario, both the individual cancer risks for benzene and formaldehyde (2e-07 and 1e-09) and the total cancer risk for the inhalation pathway (2e-7) are also below the 1e-06 threshold range. Overall, the results of the long term risk analysis indicate no potential for concern. In addition, given the conservative nature of the MEI analysis, the exposures in this scenario more than likely overstate what any individual would experience.

4.2.4 Impact Summary

Direct and/or indirect emissions associated with additional exploration and development activity within the CRNGDPA would not exceed applicable State or Federal ambient air quality regulations or standards. Maximum concentrations of potential air pollutants would occur close to and between well locations. As a result, operations associated with additional oil/gas exploration and development within the CRNGDPA would not increase the overall maximum concentration of potential air pollutants due to the overall proximity of the individual wells to each other. Potential HAP impacts would be below significance thresholds.

In reviewing these predicted impacts it is important to understand the assumptions that have been made regarding resource development. The development of this analysis includes a great deal of uncertainty in the projection of specific plans (i.e., number of wells, equipment to be used, and specific locations thereof) for resource development some 30 years in the future (LOP). All of these factors affect air emissions as well as predicted air quality impacts.

4.2.5 Suggested Mitigation Measures

The air quality impact assessment assumes that water and/or chemical dust suppressants would be applied during construction in order to achieve a 50% control efficiency (at an assumed application rate of 0.02 gallons per square yard every 4 hours) in order to minimize TSP and PM_{10} fugitive dust emissions. In addition, roads constructed on soils susceptible to wind erosion could be graveled, or dust inhibitors could be periodically used on unpaved local, collector or arterial roads which present a fugitive dust problem. The operator could also establish and enforce speed limits for all non-surfaced roads within the CRNGDPA.

4.3 CULTURAL RESOURCES

4.3.1 Introduction

Cultural resources, including archaeological and historic sites, on lands subject to federal authority are protected by various laws and regulations commencing with the *Antiquities Act* of 1906. Specific

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directives concerning Cultural Resource Management can be found in *Archaeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines* (Federal Register 1983) and BLM Manual Section 8100. Prior to the initiation of any federal action, cultural resources must be inventoried and evaluated to determine their eligibility for inclusion in the NRHP. This evaluation is a comprehensive screening process to determine significance and is designed to protect only the most significant sites. NRHP criteria (36 CFR 60.4) for determining eligibility define four (4) criteria of significance based upon "...the quality of significance in American history, architecture, archaeology, and culture present in districts, sites, buildings, structures, and objects of state and local importance that possess integrity of location, design, setting, materials, workmanship, feeling, and association; and that:

- are associated with events that have made a significant contribution to the broad patterns of our society; or

- are associated with the lives of persons significant in our past; or

- embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

- have yielded, or may be likely to yield, information important in prehistory or history".

Cultural properties are generally not eligible for inclusion in the NRHP if they lack diagnostic artifacts, subsurface remains, or structural features. Furthermore, sites that cannot be placed in a temporal context or shown to be related to other sites are usually not eligible and therefore are not officially protected.

4.3.2 Significance Criteria

Guidelines for determining adverse impacts to any site currently on, or eligible for, the NRHP have been developed by the Advisory Council on Historic Preservation [36 CFR 800.9 (b)(1),(2),(3)]. These guidelines indicate that significant impacts to cultural resources would include the following:

- destruction or alteration of all or part of an eligible property,

- isolation of a cultural resource from, or alteration of, its surrounding environment;
- introduction of visual, audible, or atmospheric elements that are either out of character with the property or alter its setting; and/or

- neglect and subsequent deterioration thereof.

These adverse impacts could be in the form of either direct, indirect, or cumulative impacts to cultural resources, which are defined below.

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1. Direct impacts would result from physical disturbance of the cultural resource, resulting in an adverse effect to the site and its setting. Construction activities would be the primary direct impact affecting identified sites or structures.

2. Indirect effects resulting from implementation of the Proposed Action would not immediately result in the physical alteration of the site or its setting. Construction of an access road into an area containing significant sites or structures would allow public access and the potential for subsequent artifact collection.

3. Indirect activities, such as collection, could ultimately alter the overall composition and contextual integrity of the site, resulting in a cumulative impact over time.

Determining the potential effect(s) of any impact depends upon the level of information available. Should the occasion arise where an unavoidable impact to cultural resources either on, or eligible for nomination to the NRHP was identified, the proponent would be required to develop a mitigation plan designed to minimize disturbance to the site. This mitigation plan would be developed in consultation with both the SHPO and the appropriate SMA. Commencement of construction activities would not proceed until the mitigation plan had been approved by both the SHPO and SMA and subsequently implemented.

4.3.3 Direct and Indirect Impacts

As indicated in Section 3.4 of this document, a total of 408.5 acres have been previously inventoried within the CRNGDPA for cultural resources. A total of 5 cultural properties were identified as a consequence of these inventories, resulting in a site density equal to approximately 1 cultural property per 81.7 acres inventoried. Assuming that future inventories within the CRNGDPA would encounter cultural properties at this average site density, we would expect an additional 19 cultural properties to be identified in conjunction with additional oil/gas activity in the project area for the LOP. However, this assumption is merely an estimate based upon the results of previous cultural inventories conducted in the area to date. Unfortunately, the likelihood of identifying potentially significant cultural resources within those areas to be affected by oil/gas exploration and development activity within the CRNGDPA is unknown at this time. However, we may assume that the probability of encountering cultural resources will increase proportionately as additional acreage within the CRNGDPA is inventoried in connection with future oil/gas exploration and development activities therein.

In response to the *National Historic Preservation Act* of 1966, federal agencies must identify (or cause to be identified) properties which are eligible (or potentially eligible) for nomination to the NRHP within the area of a federal undertaking. As a result of this and other related acts (including interpretations thereof and subsequent regulations pertaining thereto), all surface disturbing activities associated with exploration and/or development activities on federal surface and/or mineral estate within the CRNGDPA would require a cultural resource inventory prior to approval. These inventories would be performed in order to identify and preserve those sites which are culturally or

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historically important to our understanding of the history and prehistory of Wyoming. These inventories would generally consist of a 10 acre block surrounding each proposed well location, and a 100 foot corridor along proposed access road routes and pipeline alignments (50 feet either side of centerline) except where there is overlap with previous inventory coverage. Should these inventories fail to identify any potentially significant cultural materials within the impact area, approval of the pending action would be granted by the Authorized Officer. However, should potentially significant cultural resources be discovered as a result of the inventory, measures would be recommended to mitigate impacts to the cultural resource. These mitigation measures would be recommended by the Authorized Officer, in consultation with the SHPO, for the evaluation and/or preservation of the cultural resource as deemed appropriate.

Considering the nature of this resource, the fact that an inventory must be conducted, and that significant cultural resources may require mitigation prior to the approval of any surface disturbing activity on federal surface and/or mineral estate, there would be no significant impact to cultural resources resulting from oil/gas exploration and development activity associated with the Proposed Action.

4.3.4 Suggested Mitigation Measures

1. Any cultural or paleontological resource (historic or prehistoric site or object or fossil) discovered by the Operator, or any person working on his behalf, on public or federal land should be immediately reported to the Authorized Officer (AO). The operator should suspend all operations in the immediate area of the discovery until written authorization to proceed is issued by the AO. An evaluation of the discovery will be made by the AO to determine the appropriate action(s) to prevent the loss of significant cultural or scientific values. The Operator would be responsible for the cost of evaluation and any decision as to proper mitigation measures would be made by the AO after consulting with the Operator.

4.4 GEOLOGY AND MINERALS

Potential oil/gas exploration activities within the CRNGDPA would not have an adverse impact upon other mineral resources and would be consistent with management direction for the area as prescribed in the PRRA RMP. Conflicts which could interfere with the recovery of other mineral resources within the immediate project area, such as mining for gravel or uranium, would be subject to prior existing rights, thereby lessening the potential for future conflict. At this time, there are no other known mineral resources within the project area which are considered to be economically recoverable.

Minimum engineering standards established by *Onshore Oil and Gas Order Number 2* for oil/gas drilling and completion operations would ensure hole integrity and should preclude the possibility of downhole fluid migration between formations.

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4.5 HYDROLOGY

4.5.1 Introduction

Hydrologic impacts resulting from surface disturbances associated with additional oil/gas exploration and development within the CRNGDPA would include the removal of vegetation, exposure of the underlying soil surface, and compaction of the soil. These impacts would result in an increased overland flow of surface runoff with subsequent erosion and off-site sedimentation. Consequently, these changes in the local environment could create the potential for increased streamflow, increased sediment loading, and the subsequent degradation of both surface and subsurface water quality below acceptable standards, if they are not properly controlled or occur in close proximity to a perennial stream or aquifer recharge point. Both the magnitude and duration of these impacts depend upon several factors, including:

- slope aspect and gradient,
- degree and extent of soil disturbance(s),
- susceptibility of the soil to erosion, and
- proximity of the disturbance to existing stream channels.

The duration of time within which construction activities take place and the timely implementation and subsequent success (or failure) of applicable reclamation measures would also be factors. These potential impacts would be greatest soon after commencement of construction activities, but would decrease shortly after completion thereof, due to passive stabilization and implementation of erosion and sediment control measures as necessary to control runoff.

For the purposes of this anaylsis, the terms short-term and long-term, as they apply to the reclamation of disturbed areas and the subsequent establishment of vegetative growth sufficient to control excessive erosion, stabilize the soil, provide forage for both livestock and wildlife, and also to provide habitat for small mammals, passerine birds, and herptiles are defined below.

1. Short-term refers to surface disturbances that typically would be reclaimed immediately after exploration and/or development activities have been completed (e.g., non-working areas of the well pad, outslope areas of the access road, pipeline ROW's). In this regard, Section 2.2.7 states that reclamation of areas unnecessary for production operations (approximately 1.50 acres) would be completed within a maximum of 2 years following termination of drilling and completion operations, thereby reducing disturbance at each location to approximately 1.25 acres for the LOP. The establishment of a successful stand of vegetation on these reclaimed areas could be reasonably expected within 3 to 5 years following initial soil disturbance.

2. Long-term loss refers to surface disturbances that typically would not be reclaimed immediately following the completion of exploration and/or development activities (e.g., working areas of producing well locations, access road running surfaces, and ancillary facilities). These areas would not be returned to their original vegetative state within a reasonable period of time (3 to 5 years) but would remain disturbed for the LOP.

The leakage or spillage of liquid hydrocarbons and/or other fluids/chemicals utilized in drilling, completion and/or producing operations could also degrade both surface and groundwater resources. The impact of such an occurrence would depend primarily upon the quantity and chemical composition of the fluid(s) released, and the relative proximity of the spill to the water body potentially impacted.

4.5.2 Significance Criteria

The following criteria were used to determine the significance of impacts to other surface and subsurface hydrologic (water) resources within the project area.

- Degradation of existing surface water quality such that state and/or federal standards are not met.
- Modification of the quantity or quality of stream flows that affect established users such as humans, livestock, fish or wildlife.
- Project activities impact water yield(s) from existing wells or springs.
- Degradation of existing subsurface water quality in aquifers important for agricultural and/or domestic purposes.
- Total disturbance in any watershed is greater than (exceeds) 10 percent.

4.5.3 Direct and Indirect Impacts

4.5.3.1 Surface Hydrology

Because there are no perennial streams or other sources of permanent surface water (stock water reservoirs) known to exist within the project area, the potential for significant degradation of existing surface water quality in or adjacent to the CRNGDPA resulting from implementation of the proposed action is considered to be remote. As indicated in Section 2.3.5, water produced in association with additional oil/gas exploration and development within the CRNGDPA would be disposed of in strict accordance with both WDEQ/WQD and WOGCC rules and regulations for the surface/subsurface disposal of produced water.

A summary of proposed surface disturbance by watershed (as defined in Section 3.6.1 and subsequently illustrated in Figure 3.2) is presented in Table 4.2.

Table 4.2

Summary of Proposed Surface Disturbance by Watershed

Name of Watershed	Well Locations		Access Roads		Pipelines		Total Disturbance
	Number	Acres	Feet	Acres	Feet	Acres	
Adobe	5	13.75	11,000'	10.10	11,000'	10.10	33.95 acres
Poison Creek Tributary	4	11.00	8,800'	8.08	8,800'	8.08	27.16 acres
Sand Draw	43	118.25	94,600'	86.87	94,600'	86.87	291.99 acres
S. Fork Powder River	18	49.50	39,600'	36.36	39,600'	36.36	122.22 acres
Totals	**70**	**192.50**	**154,000'**	**141.41**	**154,000'**	**141.41**	**475.32 acres**

The above summary of projected surface disturbance in the CRNGDPA does not include the 10 acres associated with ancillary production facilities and the 1.92 acres associated with road reconstruction identified in Section 2.2. These surface disturbing activities would most likely occur in the Sand Draw watershed and would increase the overall disturbance in this watershed resulting from project activities to 303.91 acres. An additional 20.37 acres of surface disturbance (resulting from the remaining 3 wells) would occur in a 337 acre parcel in the extreme northern end of the CRNGDPA, which was not assigned a specific watershed designation for this analysis. This 337 acre parcel was included in the 3,074 acre Upper Sand Draw watershed, which was analyzed in conjunction with the Cave Gulch-Bullfrog-Waltman Natural Gas Development Project (CGBWNGDP) Environmental Impact Statement. No surface disturbing activities were proposed in the 3,074 acre Upper Sand Draw watershed in conjunction with the CGBWNGDP by the project proponents (USDI-BLM 1997). Table 4.3 provides the percentage of surface disturbance in each watershed which would result from additional oil/gas exploration and development activity within the CRNGDPA.

Table 4.3

Percentage of Surface Disturbance in Each Watershed

Watershed Name	Total Acres in Watershed	Acres of Disturbance	Surface Disturbance as Percent of Total
Adobe	767.20	33.95	4.43
Poison Creek Tributary	1,779.57	27.16	1.53
Sand Draw	8,159.74	303.91	3.73
S. Fork Powder River	6,734.94	122.22	1.82
Upper Sand Draw	3,074.00	20.37	0.66
Totals	**20,515.45**	**507.61**	**2.47**

The potential for off-site erosion and sedimentation throughout the CRNGDPA would be further reduced through the incorporation of site specific reclamation requirements directly into the conditions of approval for those actions within the CRNGDPA requiring federal authorization. Typically, these reclamation requirements would be developed during the permit review process (on-site inspection) and would be based upon site-specific concerns identified during the course thereof. Consequently, the potential for increased erosion and sedimentation within or directly adjacent to CRNBGDPA is considered to be insignificant when one considers the following:

- the total amount of surface disturbance which would result over the LOP from additional oil/gas exploration and development activity within the CRNGDPA (507.61 acres of short-term disturbance) represents only 8.08% of the total land area within the CRNGDPA;

- successful reclamation of disturbed areas not required for on-going production operations would result in a 56.6% overall reduction in LOP surface disturbance, thereby further reducing the potential for erosion and off-site sedimentation;

- the implementation of site specific "Best Management" reclamation practices designed to stabilize disturbed areas as quickly as possible, would result in a 78% overall reduction in erosion after the first year and an 81% reduction in erosion after five years (refer to Section 4.7.3); and

- surface disturbance resulting from additional oil/gas exploration and development activity would not exceed the 10 percent significance threshold in any of the 5 affected watersheds.

4.5.3.2 Sub-Surface Hydrology

Section 3.6.2 indicates that the Wind River Formation is the primary near-surface, fresh-water aquifer within the project area and extends from the surface to a depth of approximately 2,000 feet below the natural ground level. The upper portion of the Wind River Formation is comprised of sandstone and conglomerate with minor amounts of lenticular siltstone, claystone, and carbonaceous shales (Crist and Lowry, 1972). The upper Fort Union Formation (UFU) is sandwiched between the Wind River Formation and Waltman Shale member of the Fort Union Formation. The UFU consists of lenticular, vertically stacked, fluvial sandstones, interbedded with coals, siltstones, and shales with some thin conglomerate beds. Below the upper Fort Union Formation is the Waltman Shale member of the Fort Union Formation, which is composed mainly of lacustrine shale and mudstone and attains an average thickness of 800 feet throughout the CRNGDPA (Johnson *et al* 1996).

As indicated in Section 3.6.2, there are only 3 water wells known to exist within the boundaries of the CRNGDPA (including the CRU water supply well), with the deepest of these wells producing from a total depth of 550 feet (Cooper Reservoir Unit #1). Contamination of near-surface fresh water aquifers in the Wind River Formation from deeper geologic horizons penetrated by the well bore would be prevented by:

1) the presence of the Waltman shale between the near-surface fresh water aquifer and the deeper hydrocarbon bearing formations, and

2) casing and cementing programs designed specifically to prevent annular fluid communication between different formations downhole and the potential for contamination of near-surface fresh water aquifers (see Section 2.2.5.2).

Contamination of near-surface fresh water aquifers in the Wind River Formation from surface operations could result from the introduction of contaminated fluids onto the natural ground surface and the migration of these contaminated fluids into the aquifer over time. Intoil is considering implementation of a semi-closed mud system which would eliminate much of the potential for ground water contamination from drilling-related operations. Intoil has not yet determined if this technology will be utilized for drilling operations in the CRNGDPA. Consequently, mitigation measures have been recommended to eliminate the potential for ground water contamination resulting from seepage of either drilling or produced fluids into the subsurface. Moreover, implementation of drilling, completion, and production techniques identified in Chapter 2.0, in conjunction with the mitigation measures identified below should eliminate the potential for surface or subsurface water contamination as a result of oil/gas exploration and development activities in the CRNGDPA.

4.5.4 Suggested Mitigation Measures

1. All drilling operations should be conducted with a lined reserve pit in order to prevent drilling water loss and potential contamination of the aquifers in the Wind River Formation through seepage. The reserve pit should be lined with a vinyl/plastic liner having a permeability less than or equal to 1 X 10^{-7} cm/sec. The liner should be chemically compatible with all substances which may be put into the pit and should be installed so that it will not leak.

   Liners made of any man-made synthetic material should be of sufficient strength and thickness to withstand normal installation and pit use and should be installed with sufficient bedding (either straw or dirt) to cover any rocks, should overlap the pit walls, extend under the mud tanks, and be covered with dirt and/or rocks to hold it in place. No trash, scrap pipe, etc. that could puncture the liner should be disposed of in the reserve pit.

2. Emergency and/or production pits associated with oil/gas production operations should consist of either metal or fiberglass tanks rather than earthen pits. Where these tanks are installed in the ground, a leak detection system should be installed to prevent the potential migration of leaking hydrocarbons into the subsurface. Earthen emergency/production pits should not be allowed within the CRNGDPA.

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4.6 RANGE

4.6.1 Introduction

Actual construction of the individual well pads, access roads, pipelines, etc. would result in an overall reduction in livestock and wildlife forage and a subsequent reduction in the available animal unit months (AUMs) in each affected grazing allotment. For the purpose of assessing impacts to range resources, acres of disturbance were converted to a reduction in AUMs based upon an average of 7.5 acres/AUM for the overall project area.

4.6.2 Significance Criteria

Impacts produced by oil/gas exploration activities within the proposed lease option area would be considered significant if:

- AUMs decline by 5% or more in a single year through construction and subsequent disturbance of vegetation;
- project activities resulted in range degradation through the introduction of noxious weeds to the degree that such establishment resulted in listed weedy species occupying more than 20% of a specific vegetation type or hampering successful revegetation of desirable species in disturbed areas; or
- project activities resulted in the destruction of existing range improvements.

4.6.3 Direct and Indirect Impacts

4.6.3.1 Animal Unit Months

The primary impact to range resources would be the initial loss of vegetation and vegetative (forage) production resulting from oil/gas exploration and development activity within the overall project area. As indicated in Section 2.2, routine activities associated with oil/gas exploration and development in the CRNGDPA would result in approximate surface disturbances as follows:

- 200.75 acres associated with the construction of 73 well locations;
- 149.40 acres associated with road construction and reconstruction;

- 147.48 acres associated with installation of the gas gathering system; and
- 10 acres associated with the installation of ancillary facilities in the CRNGDPA.

Under these assumptions, the initial loss of approximately 507.61 acres of vegetation over the LOP would result in the short-term loss of 67.69 AUMs, which represents approximately 8.1% of the total AUMs available on surface lands within the CRNGDPA. Reclamation of those areas not required for ongoing production and operations would place approximately 220.36 acres back into forage production within 1 to 2 years following the initial disturbance. Reclamation of these areas would result in a long term loss of 38.3 AUM's, which represents approximately 4.6% of the total AUM's available on surface lands within the CRNGDPA. However, considering that these surface disturbances will occur over a period of 5 to 10 years rather than all at once, the potential loss of forage within the CRNGDPA is not considered as a significant impact upon the range resource.

4.6.3.2 Noxious Weeds

The invasion of disturbed areas by noxious or other undesirable weedy species would be a potential impact resulting from oil/gas exploration and development activity within the CRNGDPA. Several species of noxious weeds have become established on disturbed sites throughout Wyoming and the CRNGDPA. As indicated in Section 3.7, some of the more common weed species which could be expected to invade disturbed surfaces within the CRNGDPA include Canada thistle, musk thistle, Russian knapweed, spotted knapweed, and leafy spurge.

As presented in Section 4.5.3.1, surface disturbances associated with pad and road construction and pipeline installation would affect less than ten (10) percent of the combined surface acreage within the CRNGDPA. Considering the somewhat limited amount of surface disturbance which would be associated with oil/gas exploration and development activities within the overall project area, and that weedy species would not be expected to invade all of the newly disturbed areas, these potentially increased levels of noxious weed species would not be considered as a significant impact.

4.6.3.3 Existing Range Improvements

Range improvements which could be affected by oil/gas exploration and development activity within the CRNGDPA include:

- right-of-way fences along existing federal, state and county roads/highways, and
- water developments (e.g., water wells and stock reservoirs) located within the overall project area.

Existing fences should not be adversely affected by oil/gas exploration and development activity within the CRNGDPA. Potential impacts to these existing fences can either be avoided or mitigated as necessary to preserve the structural integrity and functional reliability thereof.

Potential impacts to existing water wells would be eliminated through implementation of drilling and completion techniques required under both *Onshore Oil and Gas Order Number One* and *Number Two*. The general lack of surface impoundments within the CRNGDPA eliminates concerns regarding sedimentation thereof. However, should surface impoundments be constructed within the CRNGDPA during the life of the project, the potential for sedimentation of these surface impoundments would be eliminated by implementation of sound reclamation practices based upon site specific data included in each individual application and any Conditions of Approval/Stipulations attached thereto by the SMA.

4.6.4 Suggested Mitigation Measures

In order to minimize the overall impact to range resources and existing range improvements within the CRNGDPA which could result from oil/gas exploration and development activity therein, mitigation measures are suggested as follows.

1. To ensure that infestations of noxious weeds are suitably controlled, the proponent should cooperate with the appropriate weed and pest control authority as necessary to implement an integrated pest management program which would be in compliance with all federal and state rules and regulations concerning the application of herbicides or pesticides.

2. In order to maintain the structural integrity of existing fences, wooden "H" braces should be installed on either side of the proposed fence cut and the fence properly tied off, prior to cutting the fence and installation of the required cattleguard.

3. All cattleguards should be routinely maintained for the duration of the project in order to eliminate the potential for any livestock migration to occur.

4.7 SOILS

4.7.1 Introduction

Impacts that could result from additional oil/gas exploration and development activity within the overall project area would include the removal of vegetation, subsequent exposure and disturbance of the soil, mixing of soil horizons, an increase in the susceptibility of the soil to wind/water erosion, loss of the soil resource, and an overall alteration in the topography of the affected area(s). The initial disturbance of the soil, in association with the potential loss of soil through erosion, could ultimately

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reduce both the quantity and productivity of topsoil available for reclamation operations. However, all available topsoil would be salvaged during initial construction and stockpiled for later revegetation in order to assure that the natural fertility and reclamation potential of the topsoil resource is not reduced (see Section 2.3.7).

Increased surface runoff and water erosion would primarily occur in the short-term and would decline over time due to natural stabilization and surface crusting, in conjunction with a direct response to erosion control, reclamation and revegetation techniques to be utilized on disturbed areas in accordance with the provisions of OOGO Number 1 and the approved APD, Sundry Notice, or Right-of-Way Grant, as applicable. Soil and climatic factors in the overall area, combined with utilization of technological and/or mechanical applications designed to enhance revegetation would generally ensure stabilization of each disturbed area within one (1) to two (2) years after initial disturbance.

4.7.2 Significance Criteria

Impacts to soils resulting from additional oil/gas exploration and development activity associated with the Proposed Action would be considered as significant if:

- exploration and development activity resulted in increased soil erosion that cannot be reduced by 50% after 1 year, and 75% after 5 years of soil disturbance; and/or
- reclamation of disturbed areas would not result in the establishment of vegetative cover adequate to stabilize the site to pre-disturbance conditions within 5 years; and/or
- productivity of the reclaimed soil does not equal pre-disturbance productivity levels, as indicated by revegetation success (e.g., vegetal cover), such that levels of pre-disturbance land use can occur.

4.7.3 Direct and Indirect Impacts

Removal of native vegetation and disturbance of the underlying soil material as a result of surface disturbing activities associated with the Proposed Action would increase the potential for loss of the existing soil resource through erosion. This potential would increase proportionately as degree of slope increases. Overall, soils within the overall project area generally have an adequate amount of topsoil available to ensure satisfactory reclamation, assuming the use of proper techniques designed to control erosion and ensure revegetation of the reclaimed areas are utilized in the reclamation process and slopes throughout the project area are relatively gentle. Additional oil/gas exploration and development activity within the CRNGDPA would result in the overall disturbance of approximately 507.61 acres of the soil resource, or less than 10% of the total surface estate included within the proposed project area (see Section 4.5.3). This level of short-term soil disturbance is not considered as a significant impact upon soil resources within the CRNGDPA.

As indicated in Table 3.6, sensitive soils comprise approximately 1,076 acres or 17.13% of the surface estate within the CRNGDPA. The bulk of these sensitive soils occur in the northeastern corner of the overall project area along Sand Draw and tributary drainages thereof (see Figure 3.2). These soils are primarily loams and clay loams derived from sodic shale which exhibit slow to very slow permeabilities, making them both susceptible to erosion resulting from runoff and poor candidates for reclamation. Fortunately, sensitive soils in the northern portion of the CRNGDPA typically occur on flat to gently sloping terrain, which would minimize the potential for erosion and sedimentation as a result of unchecked runoff and maximize reclamation efforts thereon. Moreover, all of the 1,076 acres of sensitive soils lie outside of the core area proposed for development within the CRU. As these sensitive soils lie outside of the boundaries of the CRU, exploration and development activity on these soils would most likely be limited to a minimum 80 acre spacing pattern. This would greatly reduce the overall potential for disturbance of these soils and a concomitant increase in both erosion and sedimentation resulting therefrom. The small inclusions of sensitive soils located on the west, east, and south sides of the project area could probably be avoided altogether, further eliminating the potential for an increase in erosion and sedimentation attributable to disturbance of these soils. In those instances where surface disturbing activities on these sensitive soils would be unavoidable, special reclamation techniques identified as mitigation in Section 4.7.4 should be employed to prevent undue and unnecessary degradation of the environment.

A detailed analysis of projected soil erosion rates was conducted for the Cave Gulch-Bullfrog-Waltman Natural Gas Development Project (USDI-BLM 1997). The Modified Soil Loss Equation (MSLE) was used to calculate soil erosion. Erosion rates were determined based on general assumptions of conditions and operating procedures for the comparison of alternatives and these values are presented in Table 4.4 (Grah 1997).

Table 4.4

Estimated Erosion Rates per Acre of Surface Disturbance Calculated Both With and Without the Application of Best Management Practices in Tons/Acre/Year

Type of Disturbance	Bare Soil Surface - BMP Not Applied	BMP Applied - Erosion After One Year	BMP Applied - Erosion After Five Years
Individual Well Pads	13.8 tons/acre/year	1.5 tons/acre/year	0.2 tons/acre/year
Gathering Pipelines	73.7 tons/acre/year	1.8 tons/acre/year	0.5 tons/acre/year
Access Roads	5.8 tons/acre/year	2.3 tons/acre/year	0.5 tons/acre/year

Source: Soils, Water, and Vegetation Resources Technical Report. Report prepared for the Cave Gulch-Bullfrog-Waltman Natural Gas Development Project EIS (Grah 1997).

These calculations suggest that soil erosion could be reduced to non-significant levels with the application of Best Management Practices (BMP). A summary of the estimated erosion which would result from surface disturbing activities associated with/arising from additional oil/gas exploration and development activity within the CRNGDPA is provided in Table 4.5.

Table 4.5

Estimated Erosion Rates With and Without Application of Best Management Practices in the Reclamation of Disturbed Soils in Tons per Year

Project Facility	Acres	Year 1				Year 5			
		Without BMP		With BMP		Without BMP		With BMP	
		t/ac/yr	t/yr	t/ac/yr	t/yr	t/ac/yr	t/yr	t/ac/yr	t/yr
Well Pads	200.75	13.8	2,770.35	1.5	301.13	3.1	622.33	0.2	40.15
Gathering Pipelines	147.48	73.7	10,869.28	2.3	339.20	16.4	2,418.67	0.5	73.74
Access Roads	149.40	5.8	866.52	2.3	343.62	1.5	224.10	0.5	74.70
Ancillary Facilities	10.00	13.8	138.00	1.5	15.00	3.1	31.00	0.2	2.00
Totals	**507.61**	—	**14,644.15**	—	**998.95**	—	**3,296.10**	—	**190.59**

t/ac/yr = tons per acre per year
t/yr = tons per year

Implementation of BMP for reclamation and erosion control would result in a 93% reduction in erosion in the first year and a 94% reduction in erosion by the fifth year, with implementation of BMP resulting in an overall 81% reduction in erosion after 5 years. These calculations suggest that soil erosion resulting from additional oil/gas exploration and development activity in the CRNGDPA could be reduced to non-significant levels with the application of BMP for reclamation and stabilization of disturbed soils.

4.7.4 Suggested Mitigation Measures

In order to minimize the overall impact to soil resources within the CRNGDPA which could result from additional oil/gas exploration and development activity therein, the following mitigation measures are recommended.

1. In order to protect sensitive soils, no occupancy or surface disturbance should be allowed on slopes in excess of 25%.

2. The sensitive soils identified in Table 3.7 should be avoided to the greatest extent possible. In those instances where disturbance of these soils is unavoidable, the proponent should prepare a site specific Erosion Control, Reclamation and Revegetation Plan which sets forth the

construction, reclamation, and revegetation techniques to be implemented in conjunction with the proposed surface disturbing activity.

3. All available topsoil (e.g., 6 to 12 inches) should be removed (stripped) from the areas of new construction and stockpiled for future reclamation of these disturbed areas. This stored topsoil, as well as cut and fill slopes on the well pad, should be secured from erosion through mulching and temporary revegetation (hydroseeding) if reclamation is not anticipated within one (1) year following initial construction.

4. Unused areas (borrow ditch) along the proposed access road route(s) which would be denuded of existing vegetation during initial construction should be reseeded in order to re-establish vegetative cover and reduce the overall potential for erosion and off-site sedimentation.

4.8 VISUAL RESOURCES

4.8.1 Introduction

Short-term visual impacts associated with implementation of the Proposed Action would include visual contrasts between the industrial character of the construction and drilling equipment and the somewhat natural surrounding landscape. In addition, potentially heavy volumes of sporadic truck traffic and the fugitive dust created as a result thereof, could produce negative visual impacts beyond the immediate project area (e.g., U.S. Highway 20-26). In this regard, both short-term and long-term impacts to the visual resource would be possible where patterns of line, form, color and texture in the existing characteristic landscape would be visually contrasted by drilling equipment and/or construction related disturbances to the existing topography or other readily visible site features. The severity of this impact would be dependent upon a number of factors including:

- the visual absorption capability of the surrounding landscape,
- distance from the most sensitive viewing area,
- reclamation potential of the landscape to be disturbed, and/or
- the level of disturbance to the visual resource to be created by the Proposed Action.

The duration of the impact would be a function of both the time required to complete the action and the time required for the disturbed site to return to a pre-disturbance condition. In general, the visual impact would be greatest on those sites where mitigation would be difficult and/or where the visual contrast would be highly visible to a potentially large number of viewers.

4.8.2 Significance Criteria

Visual impacts produced by the Proposed Action would be considered significant if:

- Implementation of project activities would violate management direction described and mandated by both the Platte River Resource Area *Resource Management Plan* and the *Oil & Gas Programmatic Environmental Assessment*.
- Alteration of the existing characteristic landscape would produce contrasts beyond the degree allowed for in the stated VRM guidelines, where contrasts would be visible to potentially large numbers of viewers and would appreciably diminish the aesthetic experience thereof.

4.8.3 Direct and Indirect Impacts

4.8.3.1 Introduction

As indicated in Section 3.9, the northern portion of the project area falls within a 3-mile buffer zone along U.S. Highway 20-26 which has been designated as a Class III VRM area. Within this VRM class, changes in the basic environmental (topographic) elements caused by additional oil/gas exploration and development may be evident in the characteristic landscape; however, the changes should remain subordinate to the visual strength of the existing (land) character. The southern portion of the project area has been designated as a Class IV VRM area. Under this VRM Class, changes may subordinate the original composition and character, but must reflect what could be a natural occurrence within the characteristic landscape (USDI-BLM 1982).

The following analysis of visual impacts will focus on a discussion of the visual landscape in terms of viewer proximity to intrusions related to additional oil/gas exploration and development from a foreground, middleground, and/or background perspective. For the purposes of this document, the terms *foreground*, *middleground* and *background* are defined as follows:

Foreground	- Generally the area that lies within one-half mile of the viewer.
Middleground	- The area between the foreground and background in a landscape. The area located from one-half mile to five miles from the viewer.
Background	- The distant part of a landscape located from five miles to infinity from the viewer.

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4.8.3.2 Impacts to Travelers Along U.S. Highway 20-26

The northern boundary of the CRNGDPA is located more than one-half mile south of U.S. Highway 20-26; consequently, oil/gas exploration and development activities within the project area would not affect the foreground perspective of travelers along said highway. From a middleground perspective, activities within the CRNGDPA would be almost completely screened from viewers along U.S. Highway 20-26 by existing topography, particularly from Waltman west along the highway. The most notable exception would be the derrick of both drilling and completion rigs, which would be partially visible to travelers along Highway 20-26 for the duration of drilling and completion operations. This impact would be short-term in nature and would not result in a permanent or long-term alteration in the existing landscape.

Modifications to the landscape created as a result of activities associated with the proposed action would be primarily visible to viewers along U.S. Highway 20-26 only from a background perspective, particularly for those viewers traveling west and looking to the south/southwest. From this perspective, the overall landscape is dominated topographically by the Rattlesnake Hills and Beaver Rim, which would diminish the visual impact of surface disturbing activities within the CRNGDPA. Moreover, the foreground perspective along U.S. Highway 20-26 in this area is dominated by existing facilities along both sides of the highway (see Section 3.9). These facilities would tend to distract the viewer, thereby minimizing the impact of disturbances within the CRNGDPA as these disturbances would only be visible in a background setting. Moreover, mitigation measures identified in association with this project would tend to minimize the visual impacts of additional oil/gas exploration and development to viewers - particularly from a middleground and background perspective.

Considering the magnitude and extent of pre-existing visual intrusions along U.S. Highway 20-26, implementation of the Proposed Action would not violate existing visual resource management direction for the area or produce contrasts beyond the degree allowed for in the stated VRM guidelines.

4.8.3.3 Impacts to Travelers Along Natrona County Road 212

Natrona County Road (NCR) 212 is a graveled road which departs U.S. Highway 20-26 at the community of Waltman and serves as the primary access to the Gas Hills Uranium Mining District and to outlying ranches to the south of Waltman. The county road is not classified as a Scenic Byway and probably does not receive a great deal of tourist (non-local) traffic except during the fall hunting season. As shown in Figures 1.2 and 1.3, NCR 212 bisects the CRNGDPA; consequently, intrusions on the landscape resulting from additional oil/gas exploration and development activity within the CRNGDPA would be readily apparent to travelers thereon from both a foreground and middleground perspective. However, considering the degree of visual intrusion which has already occurred within the CRNGDPA (e.g., powerlines and electric substations, pipeline compressor station(s), ranch outbuildings, oil/gas wells, etc.), any additional alterations to the landscape resulting from the

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proposed action should not result in a significant degradation of the visual landscape or violate existing management direction for this area. As stated above, mitigation measures identified in association with this project would tend to minimize the visual impacts of additional oil/gas exploration and development to viewers - particularly from a middleground and background perspective.

Considering the magnitude and extent of pre-existing visual intrusions along NCR 212, implementation of the Proposed Action would not violate existing visual resource management direction for the area or produce contrasts beyond the degree allowed for in the stated VRM guidelines.

4.8.4 Suggested Mitigation Measures

While visual intrusions which would result from project activities are not considered as significant, the following mitigation measures are suggested in order to lessen the overall visual impact associated with additional oil/gas exploration and development activity in the CRNGDPA.

1. All permanent (on-site for six months or longer) above-ground structures constructed or installed on the individual well locations (including pumping units, tank batteries, etc.) should be painted a flat, non-reflective, earthtone color to match one of the standard environmental colors as determined by the Five State Rocky Mountain Interagency Committee.

   Those facilities required to comply with *Occupational Health and Safety Act* (OSHA) rules and regulations would be excluded from this painting requirement.

4.9 WILDLIFE

4.9.1 Introduction

The overall project area provides habitat for many species of both game and non-game vertebrates, including mule deer, antelope, raptors, upland game birds, predators and furbearers. The principal impacts likely to be associated with additional oil/gas exploration and development activity within the CRNGDPA would include potential displacement of some wildlife species from preferred habitat and the potential loss of wildlife habitat as a result of project activities. Crucial habitat(s) for either big game or game bird species are not known to exist with the CRNGDPA.

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4.9.2 Significance Criteria

Impacts to wildlife species within the project area would be considered as significant if any of the following were to occur:

- project activities impact an officially-designated crucial habitat during an important use period;
- a permanent reduction in the rate of population recruitment for economically important or statutorily protected species occurred as a result of project activities; and
- a "may effect" determination was reached by the cooperating agencies for any wildlife species currently listed as either "threatened or endangered" under the ESA.

4.9.3 Direct and Indirect Impacts

4.9.3.1 Introduction

Impacts on local wildlife populations would result from direct removal or alteration of habitat, increased human presence associated with additional oil/gas exploration and development activity, and direct wildlife/human interaction. Activities associated with additional exploration and/or development activity within the CRNGDPA would temporarily eliminate approximately 507.61 acres of wildlife habitat, consisting mostly of shrubs, grasses and forbs. This would result in a proportionate reduction in the amount of herbaceous and browse forage available to herbivorous species such as antelope and mule deer, as well as a reduction in nesting, feeding and security habitat for game birds (e.g., sage grouse) and those smaller vertebrate species that may inhabit the affected areas. These habitat losses can generally be classified as being either short-term or long-term in duration, with these terms defined below.

1. Short-term loss refers to disturbances that would be reclaimed immediately after exploration and/or development activities are completed.

   Loss or alteration of habitats in grass-shrub meadows and/or on grassy slopes would be considered short-term and are expected to occur in conjunction with lease development.

2. Long-term loss would occur in areas that could not be returned to their original vegetative state within a reasonable period of time (3 to 5 years), such as producing well sites, access roads, and ancillary facilities (e.g., compressor station and/or centralized production facility).

4.9.3.2 Habitat Loss and Displacement

Disturbances resulting from well pad, access road, pipeline, etc. construction associated with additional exploration and development activity within the CRNGDPA would result in the loss of smaller, less mobile species of wildlife, such as small mammals and reptiles until such time as reclamation has been completed. However, considering the relatively small geographic area of disturbance, the actual magnitude of this loss and the subsequent displacement would be minimal. The displacement of more mobile species to adjacent undisturbed habitats, while difficult to predict, would be relatively short-term in nature given the overall duration of intensive activities associated with the proposed project.

Rather than direct habitat loss, the greatest impact on wildlife populations would be from displacement of economically important wildlife species such as antelope and mule deer from preferred habitats as a result of increased level(s) of human activity (including vehicular traffic) and associated noise. The extent of this displacement is difficult to predict when one considers that response to noise and human presence varies from species to species as well as among individuals of the same species. In some cases, wildlife species may habituate to noise and human presence after initial exposure, and begin to re-invade areas that were formerly avoided. It is commonly assumed that these effects are detrimental to individual species and numerous studies have examined the effects of human presence on big game species (Klein 1974; Irwin and Peek 1979; Ward and Cupal 1979; MacArthur *et al* 1982; Brekke 1985). However, research on the relationship between displacement from preferred habitats and increased stress due to human harassment (both intentional and otherwise) on overall population dynamics has been inconclusive to date.

In addition to the avoidance response, an increased human presence intensifies the potential for wildlife-human interactions ranging from the harassment of wildlife to poaching and increased legal harvest. Likewise, increased traffic levels on existing access roads could increase the potential for wildlife-vehicle collisions. These collisions are most frequent where roads traverse areas commonly frequented by game species. Considering the relatively minimal road network to be constructed in association with additional oil/gas exploration and development activity within the CRNGDPA, the generally short duration of intensive field activities (i.e., construction, drilling, and completion operations), combined with the insignificant amount of daily/weekly production traffic expected within the field, the potential for adverse wildlife-human interaction is considered to be minimal.

4.9.3.3 Economically Important Species

The project area includes year-round habitat for several economically important game species including pronghorn antelope (*Antilocapra americana*), mule deer (*Odocoileus hemionus*), and sage grouse (*Centrocercus urophasianus*). While the project area includes year-round habitat for the above species, crucial habitat(s) for these species are not known to occur within the overall project area. Consequently the short-term (initial) loss of 507.61 acres of habitat (8.01% of the CRNGDPA) and the potential long-term loss of 287.25 unreclaimed acres of habitat (4.57% of the CRNGDPA) is not viewed as significant when one considers the relative availability and abundance of adjacent, undisturbed habitat. Moreover, considering that no crucial wildlife habitat(s) will be affected by implementation of the Proposed Action, the potential for long-term displacement and/or significant individual losses attributable to human activities within the CRNGDPA are considered to be insignificant. The above determination has been made despite the fact that population numbers are currently below objective levels as indicated in Section 3.11.3. Likewise, activities associated with oil/gas exploration and development in the overall project area would result in the loss of smaller, less mobile species of wildlife, such as small mammals and reptiles, from the area(s) of disturbance until such time as these activities ceased and site-specific reclamation had been achieved. Considering the relatively small percentage of total surface disturbance proposed within the 6,282.38 acre project area, the actual magnitude of this loss and subsequent displacement would be minimal. The displacement of more mobile species to adjacent, undisturbed habitats, while difficult to predict, would be relatively short-term in nature given the overall duration of exploration activities associated with the Proposed Action.

4.9.3.4 Raptor Species

As indicated in Table 3.8 (Section 3.11.4), there are currently 14 raptor nests known to exist either within or directly adjacent to the CRNGDPA. Eleven of these nests are within the boundaries of the CRNGDPA, with the remaining 3 nests (140, 143, and 197) located within one-half (1/2) mile of the project area boundary (see Figure 3.4). Nesting activity by ferruginous hawks (*Buteo regalis*) was observed within the CRU in 1996 and again in 1997. Two young were fledged from nest 169 in July of 1997, while nesting activities failed at nest 64 for unknown reasons (AEC 1997). Likewise, nesting activity by a pair of golden eagles was observed in 1996 by BLM personnel at nest 192, with 2 young subsequently fledged from this particular nest that year.

Exploration and development activity associated with the Proposed Action would result in a predicted well spacing of 1 well per 40 acres in both Sections 3 and 10 of Township 35 North, Range 87 West, with the subsequent development completely surrounding ferruginous hawk nests 64, 65, 169, and 170. The fact that these nests are centrally located within the Cooper Reservoir Unit virtually assures that some level of development will occur in close proximity to the nest sites - particularly in the case of nests 64 and 65. The proposed action would also result in a predicted spacing pattern of 1 well per 80 acres around golden eagle nest 192 in Section 33 of Township 36 North, Range 87 West. This particular area of the CRNGDPA is somewhat removed from the center of the gas field as currently defined; consequently, it is difficult to predict if full development of the mineral acreage surrounding nest 192 would ever occur. However, for the purposes of this document, we must assume that implementation of the Proposed Action would result in additional oil/gas exploration and development activity in proximity to the nest.

Surface disturbance and concomitant human intrusion(s) associated with additional oil/gas exploration and development activity within the CRNGDPA could have a negative effect upon raptor nesting success within the overall project area, if these activities were allowed to proceed during the nesting season. Moreover, it is predicted that the 3 pairs of nesting raptors referenced above may be

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displaced if the Proposed Action is implemented and the maximum number of wells predicted are drilled and subsequently completed as producing gas wells. In this regard, the mitigation measures suggested in Section 4.9.5 have been specifically designed to minimize impacts to nesting raptors.

4.9.3.5 Threatened and Endangered Species

Section 3.11.5.1 identified two (2) species which have been classified as either threatened or endangered under the ESA and which may occur within the CRNGDPA as follows:

- **Bald eagle** *(Haliaeetus leucocephalus)*

  While the CRNGDPA does not provide suitable perching or roosting habitat for bald eagles, the overall area may receive sporadic use by individual eagles engaged in opportunistic foraging activity during the winter months. However, considering the general lack of suitable habitat (perching and/or roosting areas) within the overall project area, it is unlikely that bald eagles would routinely utilize the project area or be affected by oil/gas exploration activities therein.

- **Black-footed ferret** *(Mustela nigripes)*

  It is well documented that black-footed ferrets depend primarily upon prairie dogs *(Cynomys ssp.)* for food and upon prairie dog burrows for shelter (Hillman and Clark 1980, Fagerstone 1987). Cursory inventories of the CRU and adjacent areas conducted in the spring/summer of 1997 in conjunction with an inventory of raptor nesting therein failed to identify any prairie dog colonies within the inventoried areas. Field work by BLM personnel during the past two years has also failed to locate any prairie dog towns in or adjacent to the project area. While it is possible that small, isolated prairie dog colonies may exist within the overall project area, it is unlikely that these colonies are of sufficient size to support a viable population of black-footed ferrets.

4.9.3.6 Candidate Species

4.9.3.6.1 Swift fox (*Vulpes nigripes*)

Although no swift fox have been documented in the CRNGDPA, there is a possibility that the species may inhabit the overall area. In this regard, investigations of swift fox populations in southeastern Wyoming (SFCT 1996) suggested a minimum density estimated at 1.6 fox per 10 square kilometers (1.6/10 km^2). Likewise, swift fox investigations in South Dakota (Sharps 1984) suggest that swift fox tend to stay within a 1.6 to 3.2 kilometer (km) area during the denning season (April through June), but expand their territory to an 11.2 to 12.8 km (or larger) area during the winter months. This data would suggest that the 6,282.38 acre (9.82 mi^2) project area could support approximately

1.58 breeding pairs of swift fox during the spring and summer months, with the individual foxes expanding their range (territory) considerably during the lean winter months.

Based upon these estimated densities, it is unlikely that additional oil/gas exploration and development activity within the CRNGDPA would displace individual foxes from preferred habitat or have an adverse impact upon breeding pairs which may inhabit the area due to the low densities thereof. Conversely, additional development within the area could actually enhance swift fox habitat and population recruitment by increasing the available food supply, providing a wider range of denning sites in disturbed areas, and providing some protection from competition and predation by coyotes, which tend to avoid areas of human presence. Available literature on the swift fox (Sharps 1984; Jones, Jr. *et al* 1987; SFCT 1996) suggest that these animals routinely establish dens in areas which are actively used by humans (e.g., cultivated fields, cemeteries, along roads, etc.) and that these sites are probably selected as a function of both burrowing ease (for denning purposes) and proximity to their preferred food supply (primarily small mammals). In this regard, facilities associated with oil/gas production often provide habitat for small mammals such as mice, ground squirrels, and rabbits which take up residence in and around these facilities. During the winter months, these facilities would provide a haven from the harsh winter weather for these small mammals, thereby enhancing the available food supply for foxes foraging in the area. Moreover, surface disturbing activities associated with road/well pad/pipeline construction would also provide the fox with sites which could be easily excavated for use as dens in areas of rocky soil/soil hardpan. It is common knowledge that burrowing animals routinely use disturbed right-of-ways for den construction.

4.9.3.6.2 Mountain plover (*Charadrius montanus*)

As indicated in Section 3.10.5.2 , there have been 8 mountain plover sightings recorded in the 6,084 mi^2 search area since 1981, with one sighting in 1997 made approximately 9 miles northeast of the northern boundary of the CRNGDPA. Table 3.9 provides specific information on these sightings.

Mountain plovers in Phillips County, Montana selectively nest in prairie dog (*Cynomys* ssp.) colonies (Knowles *et al* 1982, Olson and Edge 1985) in vegetative settings that include prickly pear cactus (*Optunia polycantha*), fringed sagewort (*Artemesia frigida*), big sagebrush (*Artemesia tridentata*), western wheatgrass (*Agropyron smithii*) and blue grama. Plover nests in these Montana prairie dog towns typically occur in areas of approximately 27% bare ground (Knopf and Miller 1994). Nesting activity in the Pawnee National Grasslands (southeastern Colorado) tend towards areas of low herbaceous vegetation, reduced shrub cover, near prominent objects such as cow manure piles or similar-sized rocks, (Graul 1975, Olson and Edge 1985). Research conducted by Knopf and Miller (1994) of nest site selection on the Pawnee National Grasslands in 1991 and 1992 suggests that 30% bare ground is a minimal habitat requirement for nest site selection.

Considering that there are no known prairie dog colonies within the CRNGDPA and areas of bare ground or sparsely vegetated soils are extremely limited, it is unlikely that the area supports a breeding population of mountain plovers.

4.9.4 Impact Summary

Disturbances associated with oil/gas exploration and development activity within the CRNGDPA would result in some displacement of wildlife species from preferred habitats. Although these impacts are somewhat difficult to quantify, they increase as the degree of human intrusion increases. This is particularly true when these intrusions encroach upon essential (critical) habitat elements required by wildlife species. However, these impacts are not considered as significant in view of the following:

- the general lack of identified crucial habitat(s) for economically important game species including antelope, mule deer, and sage grouse;
- the relative availability of adjacent, similar habitats which would absorb the mobile species of wildlife displaced from the affected area as a result of oil/gas exploration activities therein;
- the low percentage of surface disturbance and resultant habitat loss which would result from the oil/gas exploration activities associated with the Proposed Action;
- implementation of the Applicant Committed Practices enumerated in Chapter 2.0; and
- implementation of the mitigation measures suggested below.

4.9.5 Suggested Mitigation Measures

As a result of this analysis process, the following mitigation measures are recommended to minimize impacts to wildlife resulting from additional oil/gas exploration and development activity within the CRNGDPA.

1. All project workers should be instructed about the nature of raptor species that occur on the project area, potential impacts to these species, and measures that can be taken to avoid or minimize impacts. They should also be advised of federal and state regulations and laws concerning harassment and illegal kill of raptor species.

2. If above-ground power lines are installed, power pole cross arms should be configured by the owner of the power line according to specifications described in Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996 (Avian Power Line Interaction Committee) so as to eliminate the potential for raptor electrocution.

3. Seasonal restrictions of construction activities within 1/4 mile of occupied raptor nests should be applied. An occupied nest is defined as one where eggs or young are being incubated or tended. Occupied nests should be protected during the nesting period until the young have safely fledged. Normally the exclusionary time window for nesting activities extends from February 1 through

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July 31 for golden eagles and from March 15 through July 31 for other species. The AO may modify these dates depending on the specific circumstances surrounding individual nests.

Seasonal restrictions should be applied as follows:

- Any activity initiated prior to February 1 may be completely finished. This means a well may be permitted (casual uses), drilled, completed, and hooked up without restrictions unless activities on the drill site cease for 3 weeks or longer between February 1 and June 1. In the event of such prolonged inactivity, a nest survey must be performed in the 1/4-mile radius surrounding the drill site to determine whether or not an occupied nest has been established during the period of inactivity. If an occupied nest is found, the operation must temporarily cease until the young have fledged.

- Any activity initiated between February 1 and June 1 should require a nest check either by the BLM or an Operator representative approved by the BLM within 1/4 mile; if an occupied nest is present, activity would be restricted during the critical period.

4. Casual use activities away from existing roads and facilities that are scheduled to occur between March 1 and mid-June should be coordinated with the BLM in order to minimize or avoid potential impacts to nesting raptors in the area.

   Casual uses include, but are not limited to, ground activities such as: (1) preliminary scouting of routes or sites, (2) land surveying and staking, and (3) cultural and wildlife surveys. Because casual use is generally not treated as a managed or permitted activity, there is a potential for causing impacts to nesting raptors.

5. Raptor nests that are discovered by the Operator or Operator's representatives should not be approached and should be immediately reported to the BLM. Employees should be directed not to enter buffer zones, established by the BLM to reduce stress to raptor adults or young and to prevent nest abandonment.

6. The operator should construct Artificial Nest Structures (ANSs) in those raptor territories where permanent facilities are established which would/could compromise the functionality of existing nest structures as outlined below. These new nest structures (ANSs) should be installed in areas which are farthest removed from proposed well sites and on-going human activity in order to maximize nest site alternatives within the affected territories. The operator should obtain the necessary authorizations from and coordinate the installation of ANSs with the appropriate federal and state regulatory agencies prior to the installation thereof.

   In order to mitigate impacts to those raptor nesting territories encompassing nest numbers 64/65 and 169/170, the operator should install a minimum of two ANSs per territory as outlined above. As the 1998 nesting season is already underway, these ANSs should be installed subsequent to the 1998 nesting season and prior to November 15, 1998. Pending the results of potential exploration and development activity as proposed in Table 2.1, placement of these nesting structures is tentatively recommended as follows:

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a) Ferruginous Hawk Southern Nesting Territory (nests 169 and 170):

1. Place one structure in the SE¼SE¼ of Section 9, Township 35 North, Range 87 West. This particular location is between two abandoned wells (CRU #1 and CRU #4); consequently, additional exploration and development in this corner of the CRNGDPA is unlikely. The proposed ANS would be located on federal surface at a minimum of 2,000 feet from both Natrona County Road 212 and the existing access into the CRU #6.

2. The second ANS should be placed in the NE¼SW¼SW¼ of Section 11, Township 35 North, Range 87 West on the south side of the South Fork of the Powder River. As above, this area is removed from existing and/or currently proposed development within the CRU and the potential for future development in this corner of the CRNGDPA is considered to be remote.

b) Ferruginous Hawk Northern Nesting Territory (nests 64 and 65):

1. Nest numbers 64 and 65 are located not only in the heart of the proposed CRNGDPA but also within an extensive block of private surface (see Figure 1.4), making placement of ANSs on public lands within a reasonable radius (within the territory) of the existing nests most difficult. Consequently, it is recommended that placement of these ANSs be delayed until after the results of the 1998 drilling season are known. Once a determination of commercial productivity of these wells has been made, Intoil should arrange a meeting with BLM, USFWS, WGFD, and the private surface owners to discuss ANS placement in or adjacent to the CRNGDPA and/or possible alternatives. If for some reason the proposed ANSs can not be located within this particular nesting territory, the structures would be located in an alternate area to be provided by BLM. Conditions of Approval (COAs) would be attached to permits for wells proposed within 1/4 mile of these nests which would require that 2 ANSs be installed after the nesting season and prior to November 15, 1998 if commercial production is achieved.

c) Golden Eagle Nesting Territory (nest 192):

1. In order to mitigate potential impacts to the golden eagle nesting territory encompassing nest 192, the operator should install a minimum of two ANSs as outlined above. These ANSs should be installed only in the event that commercial production is established by Intoil within a one-half (1/2) mile radius of the existing nest structure and ongoing nesting inventories verify future use of the nest by golden eagles. As nest number 192 is also located in an area of extensive private and/or State of Wyoming surface ownership (see Figure 1.4), a meeting should be scheduled with BLM, USFWS, WGFD, and the private surface owner/grazing lessee to discuss ANS placement as soon as possible after production has been established in proximity to the subject nest. If for some reason the proposed ANSs can not be located within this particular nesting territory, the structures would be located in an alternate area to be provided by BLM. Conditions of Approval (COAs) would be attached to permits for wells proposed within 1/4 mile of these nests

which would require that 2 ANSs be installed after the nesting season and prior to November 15*th* of the following year if commercial production is achieved.

4.10 IMPACTS OF THE NO ACTION ALTERNATIVE

As discussed in Section 2.4, selection of the No Action Alternative would effectively deny further oil/gas exploration and development activity within the CRNGDPA as currently proposed. However, it should be noted that selection of the No Action Alternative is not a denial of all natural gas exploration and development in the area. Under the No Action Alternative, development of lands in the CRU and adjoining areas could occur at levels similar to those which have occurred on the area in the past and could occur as authorized by existing management directives contained in the Platte River RMP, which includes the requirement for a site-specific NEPA analysis. Under this alternative, impacts to the human environment within the overall project area would continue to occur as additional exploration and development activity was authorized, but these impacts would be of an indeterminate nature since the actual level of exploration and/or development would be unknown.

4.11 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

4.11.1 Introduction

The term "Irreversible Commitment of Resources" refers to the loss of future options which would result from additional exploration and development of those lands included within the CRNGDPA and primarily applies to the resultant impacts upon:

- non-renewable resources such as minerals or cultural resources; or to
- processes or factors that are renewable only over long periods of time (e.g., soil productivity).

Likewise, the term "Irretrievable Commitment of Resources" refers to the loss of production, harvest, or use of natural resources. For example, some or all of the forage production from an area is irretrievably lost while the area serves as an oil/gas well pad. Although the production loss is irretrievable, the action is not irreversible and, if the land use changes though subsequent abandonment and reclamation, forage production could resume.

4.11.2 Air Quality

No irreversible or irretrievable commitment of resources would occur to air quality. Short-term impacts to air quality resulting from oil/gas exploration and development within the CRNGDPA would be reversible. Similarly, these impacts would not be irretrievable since air quality is a transient characteristic subject to improvement through natural meteorological movements within the atmosphere.

4.11.3 Cultural Resources

Should cultural resource inventories fail to identify or inventory all sites and/or artifacts within the proposed area(s) of disturbance, there is a possibility that the cultural resource could be damaged or destroyed during subsequent construction activities. Such an impact would be both an irreversible and irretrievable commitment of the affected cultural resource. Likewise, the loss of contextual information that could have been retrieved from the undamaged cultural site would also be an irretrievable commitment of the cultural resource.

The loss of cultural properties as a result of vandalism or artifact collection would be both an irreversibale and irretrievable commitment of resources as well.

4.11.4 Geology and Minerals

The removal of oil and/or natural gas from the affected geologic formation(s) would be both an irreversible and irretrievable commitment of resources. Once the hydrocarbons have been removed from the formation and put to other uses, the resource has been irreversibly and irretrievably lost.

4.11.5 Hydrology

No irreversible and only a minimal irretrievable commitment of resources would occur to the hydrologic environment of the project area. Water withdrawn from the Wind River Formation and subsequently used during drilling operations would be withheld from other uses and would be irretrievably lost to other uses.

Soil disturbances associated with additional exploration and development activity within the CRNGDPA could result in the discharge of sediments into surface waters and would constitute both an irreversible and irretrievable commitment of resources - both from the standpoint of lost soil resources and subsequent alteration of water quality in the affected drainages.

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4.11.6 Range

The only potentially irreversible commitment of range resources would result from the direct mortality of individual plants resulting from surface disturbances associated with oil/gas exploration and development activities, which would translate into a direct reduction of available forage for both livestock and wildlife use. However, plants - both as populations and communities - have the reproductive potential to renew themselves. Consequently, this loss of individual plants would be reversible in the long term as disturbed areas were reclaimed. Likewise, the interim loss of vegetative cover types and associated resources (AUM's) would be a minor irretrievable commitment of resources. As above, this irretrievable commitment of resources (loss of forage) would persist until such time as the disturbed area(s) had been reclaimed and their original productivity restored.

4.11.7 Soils

Any loss of topsoil during oil/gas exploration activities within the lease option area and the subsequent loss or reduction in soil productivity resulting from these activities would be considered as an irreversible commitment of the soil resource. However, this commitment is expected to be quite small when one considers the relatively small amount of soil disturbance that would result from additional oil/gas exploration and development activity within the CRNGDPA. A minimal irretrievable commitment of the soil resource would result from the disturbance of previously productive soils resulting from surface disturbing activities such as road and well pad construction. This commitment of resources would last until final project abandonment and reclamation.

4.11.8 Visual Resources

Visual intrusions resulting from alterations to the natural landscape would represent an irretrievable commitment of resources. However, these visual intrusions on the landscape are not irreversible and would be eliminated upon final abandonment of oil/gas related facilities within the CRNGDPA and subsequent reclamation of disturbed areas associated therewith.

4.11.9 Wildlife

The only irreversible commitment of resources that could occur to wildlife populations within the CRNGDPA would be the direct mortality of individual animals. Wildlife species have the reproductive capacity to renew themselves and thereby maintain their populations, given the overall availability of quality habitat within the general vicinity of the potential impact. Considering both the availability and diversity of wildlife habitat existing throughout the overall project area, no irreversible commitment of resources would be expected to wildlife populations in the affected area.

The loss of habitat use associated with actual oil/gas exploration and development activity due to displacement (alteration of behavioral patterns) resulting from human intrusion would be an irretrievable commitment of wildlife resources; however, with proper timing constraints, the magnitude of such a commitment would be small and the commitment would be reversible upon final project termination and reclamation.

4.12 RESIDUAL IMPACTS

The term "residual impacts" refers to those impacts remaining after all reasonable mitigation has been applied. The disturbance of approximately 507.61 acres of soil and related wildlife habitat resulting from construction associated with additional oil/gas exploration and development activity within the CRNGDPA would constitute a short-term impact, considering that a significant portion of this initial disturbance (220.36 acres) would be reclaimed within a relatively short period of time following initial disturbance. The remaining 287.25 acres of initial surface disturbance would not be reclaimed until termination of the project and would, therefore, represent a long-term (or residual) impact to the affected resources. This long-term impact to both the soil and related resources would also represent a residual loss of both domestic livestock and wildlife forage, as well as associated wildlife habitat for a comparable period of time.

Construction of roads and drill pads, in conjunction with the installation of permanent production facilities (as applicable) on selected well locations would result in a long-term (or residual) impact to the visual resource of the area. Final abandonment of the project, plugging of each individual well, reclamation and revegetation of the remaining 287.25 acres of disturbed surface area and cessation of project related human intrusions into the area would effectively eliminate all of the above-referenced residual impacts associated with this project.

4.13 CUMULATIVE IMPACTS

4.13.1 Introduction

Pursuant to NEPA, the BLM must consider the cumulative impacts of the Proposed Action in conjunction with other ongoing oil/gas exploration and development activity within the general area. In addition, unrelated activities within the overall project area which might have an adverse impact upon existing natural resources in the area and, consequently, which would further contribute to the overall degradation of the human environment must be considered in the analysis of cumulative impacts as well. In this regard, the only major resource development activity within the CRNGDPA consists of past and present oil/gas exploration and development in the Cooper Reservoir Unit and surrounding areas as depicted in Figure 1.3 and outlined in Table 3.3. Considering that the PRRA, BLM has not received any proposals for additional resource development or major surface disturbing

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activity (e.g., mines, highways, and/or industrial sites) in or adjacent to the CRNGDPA, the Proposed Action represents the only reasonably foreseeable resource development in the overall project area.

For the purposes of this Environmental Assessment, a Cumulative Impacts Analysis (CIA) area was defined for those resource components potentially affected by additional oil/gas exploration and development within the CRNGDPA. The CIA area was defined by watersheds as depicted in Figure 3.2. These watersheds encompass a total of approximately 17,441.45 acres, 11,159.07 acres (64%) of which are located outside of the CRNGDPA boundary (see Section 4.5.3.1 and Figure 4.1).

Existing surface disturbance within the CIA area was quantified from aerial photographs of the area taken on June 7, 1996. Existing surface disturbance as of June 7, 1996, along with additional surface disturbance which has occurred in the area since the June 7, 1996 overflight are quantified in Table 4.6, while Tables 4.7 and 4.8 attempt to quantify these surface disturbances by disturbance type.

Table 4.6

Summary of Total Surface Disturbance in the Cumulative Impacts Analysis Area by Watershed

Name of Watershed	Facilities (acres)	Co. Road (acres)	Resource Roads (acres)	Pipelines (acres)	2-Tr. Trails (acres)	TOTAL (acres)
Adobe	0.00	0.00	0.00	9.49	3.91	13.40
Poison Creek Tributary	0.00	0.00	0.00	0.00	2.22	2.22
Sand Draw	23.97	24.91	13.96	31.31	25.60	119.02
S. Fork Powder River	2.39	14.18	5.66	32.51	10.44	63.21
Upper Sand Draw	0.00	0.00	0.00	0.00	2.92	2.92
Totals	**26.36**	**39.09**	**19.62**	**73.31**	**45.09**	**203.47**

Table 4.7

Linear Surface Disturbance in the Cumulative Impacts Analysis Area

Disturbance Class	Total Length	Width	Area (acres)
Natrona County Road 212	28,378'	60'	39.09
Pipeline ROW's	21,847'	60'	73.31
Resource Roads	21,376'	40'	19.62
Two-Track Trails	327,367'	6'	45.09
Total			**177.11**

The cumulative impacts analysis area for air quality and raptors coincides with the CIA utilized in the CGBWNGDP EIS (USDI-BLM 1997).

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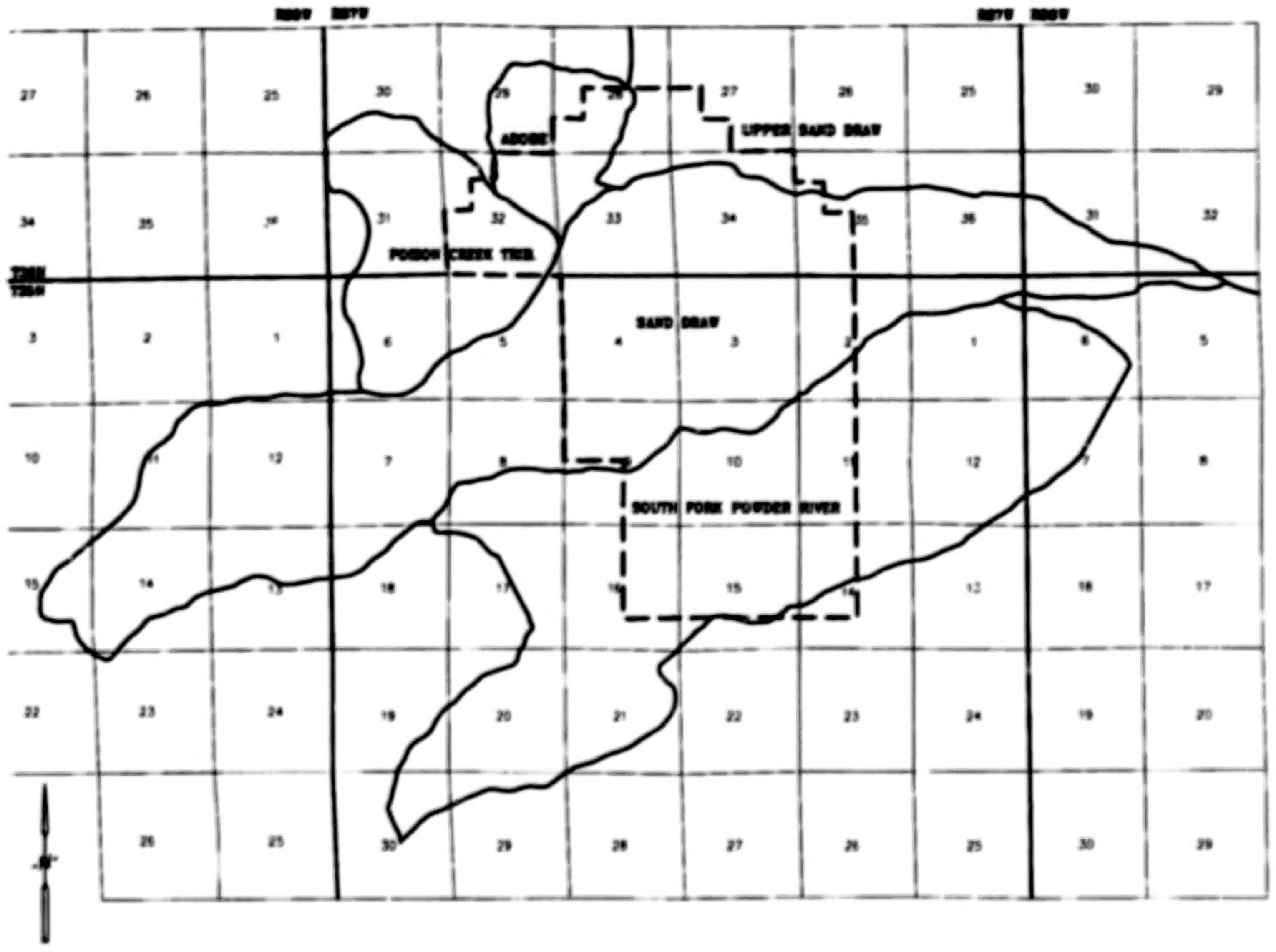

FIGURE 4.1 Designated Watersheds for CRNGDPA Cumulative Impact Analysis

Table 4.8

Non-Linear Surface Disturbance in the Cumulative Impacts Analysis Area

Facility Operator	Facility Name	Facility Description	Area (acres)
Intoil, Inc.	CRU # 1	Injection Well	1.46
Intoil, Inc.	CRU # 6	Shut-In Gas Well	2.39
Intoil, Inc.	CRU # 7	Producing Gas Well	2.10
Intoil, Inc.	CRU # 8	Producing Gas Well	2.56
Intoil, Inc.	CRU # 9	T/A Gas Well	2.32
Intoil, Inc.	CRU #10	Producing Gas Well	2.32
Intoil, Inc.	CRU #11	Producing Gas Well	3.06
Intoil, Inc.	CRU #12	Producing Gas Well	2.32
Intoil, Inc.	CRU #13	Producing Gas Well	2.32
Intoil, Inc.	CRU #14	Producing Gas Well	2.32
Intoil, Inc.	CRU Compressor	Compressor Station	1.00
Warren Enterprises, Inc.	1-4 DS Federal	Shut-In Gas Well	1.27
Warren Enterprises, Inc.	1-33 WS Federal	Shut-In Gas Well	0.92
Total			**26.36**

4.13.2 Air Quality

In conjunction with the air quality modeling discussed in Section 4.1, an assessment of potential cumulative air quality impacts was also conducted in order to predict cumulative air quality impacts at the PSD Class II Cloud Peak Wilderness Area (CPWA). Three different groups of sources were modeled as follows:

1) emissions from additional exploration and development in the CRNGDPA (maximum production scenario of 85 wells plus a 5,000 hp compression facility);

2) emissions from 34 other well field sources located within the study area (Johnson, Washakie, Big Horn, Sheridan, and Natrona counties); and

3) other emission sources located within the study area that have been issued WDEQ/AQD air pollutant emission permits (including oil and gas wells that have been permitted by the WOGCC since January 1996).

Modeling of potential cumulative air quality impacts was performed to quantify NO_2, SO_2, and PM_{10} impacts at the CPWA boundary, in order to calculate potential nitrate and sulfate deposition (and related water chemistry impacts) at a U.S.D.A. Forest Service (USFS) identified sensitive lake watershed, and to address potential changes in regional visibility. It is important to place these modeling results into a proper perspective in terms of the level of conservatism factored into this analysis. The projected impacts reflect "screening" level modeling (a modeling approach that is conservative by design). Therefore, if the modeling results are less than applicable significance criteria there is no need to perform a more refined analysis. There is a great deal of uncertainty in the projection of specific plans (i.e. number of wells, equipment to be used, and specific locations) for resource development for 30 years in the future. The following conservative assumptions have been incorporated into this analysis:

1) For several reasons, the assumed emission rates overstate the actual emissions that are likely to occur. First, these emission rates assume that all of the potential well sites become producing wells; that is, there are no "dry holes" (e.g., wells that deemed to be non-productive). Second, the emission rates assume that all producing wells would produce for 30 years, which will certainly not be the case. Third, these emission rates are predicated on the assumption that all well production activity occurs at the maximum possible emission rate continuously. Fourth, the maximum emissions scenario assumes that all emission sources (well field compression and all 85 wells) are operating at their maximum potential emission rates simultaneously.

   Given the number of sources included in this analysis (approximately 472 emission sources) the co-probability of such a scenario actually occurring over an entire year or over a 24-hour time period is extremely small. While this assumption is typically used in such modeling analyses, the resulting impacts will be overstated. It should also be noted that as the number of sources increases, the level of conservatism also increases.

2) The ISCST3 model utilizes instantaneous straight line plume transport. Thus the model does not account for the actual travel time and distance that a plume would undergo as it is transported from the point of release to the receptors in the PSD Class II Cloud Peak Wilderness Area. Because of this assumption the model significantly overestimates the number of times that a plume actually reaches a sensitive receptor. Also, because the model cannot predict the varying route of an actual plume, the travel distance is underestimated and the concentration is overstated. For near field impacts this limitation is not very important, however, for travel distances greater than 50 kilometers this assumption becomes very conservative.

3) The complex terrain treatment in the ISCST3 model also conservatively addresses plume transport for elevation increases of greater than 3,000 feet. Even though a trajectory could transport the plume toward the sensitive receptor, it is doubtful that it would climb the 3,000 feet necessary to reach the sensitive receptors.

Although it is unlikely these assumptions would actually occur, it is appropriate to include them in order to perform a "reasonable, but conservative" cumulative air quality impact assessment. Since there are no Federal or state atmospheric deposition or visibility regulations for PSD Class II wilderness or for wilderness study areas (WSAs), the air quality impact assessment did not estimate potential impacts at BLM-administered WSAs. However, at the request of the USFS, estimates of potential atmospheric deposition and visibility impacts were made for the CPWA (Blett 1998).

Water samples collected at Florence Lake (located within the CPWA) by the USFS between 1994 and 1996 indicated a range in acid neutralizing capacity (ANC) from 27.8 to 64.7 microequivalents

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per liter (µeq/l). Maximum cumulative atmospheric deposition at Florence Lake was predicted to be 0.02 kilograms per hectare-year (kg/ha-yr) of nitrogen and 0.005 kg/ha-yr of sulfur. The potential ANC change at Florence Lake was predicted to be 0.5 percent, while the maximum predicted change in pH was 0.002. These potential impacts are all well below the USFS's "Limit of Acceptable Change" threshold values of 3 kg/ha-yr (aquatic nitrogen), 5 kg/ha-yr (terrestrial sulfur), 10 per cent change in ANC (for lakes with a minimum ANC greater than 25 µeq/l, such as Florence Lake), and 0.1 pH units (Fox *et al* 1989). Since cumulative emission sources constitute many small sources spread out over a very large area, discrete visible plumes are not likely to be created or to impact the CPWA. However, the potential for cumulative increased regional haze and visibility degradation is a concern. Regional haze is caused by fine particles and gases scattering and absorbing light. Changes to regional haze are measured in terms of visibility differences relative to background (existing) conditions.

The Interagency Workgroup on Air Quality Modeling (IWAQM) has prepared a very conservative screening method to estimate potential, regional haze impacts (IWAQM 1993). This method involves modeling SO_2, NO_2, and particulate emissions to estimate fine particle concentrations at the area of concern and to compute the potential visibility reduction which is defined in terms of "deciview" change. The magnitude of deciview change, its frequency, time of the year and meteorological conditions during times when deciview thresholds are above 1.0, as well as the inherent conservatism of the analyses, must be considered when assessing the significance of potential visibility impacts. The ISCST3 model was used to estimate the maximum cumulative 24-hour air quality impacts along the CPWA boundary. For this analysis, NO_2 is the only pollutant of concern since sulfur emissions are unlikely as natural gas produced from the Lower Fort Union and Lance Formations is "sweet," and direct PM_{10} impacts are negligible.

Background visibility was assumed to be 327 kilometer (km) Standard Visual Range (SVR) based on data provided by the USFS monitoring program (Blett 1998). This represents a 90*th* percentile, best-case visibility for every day in a year. This is a very conservative assumption since the theoretical maximum possible visibility is 391 km SVR. Conservative assumptions also were made about plume transport time, the conversion efficiency of NO_x to ammonium nitrate, and the improbable coincidence of a 327 km visibility condition occurring with an atmospheric relative humidity of 90%.

Based on these very conservative analysis assumptions, the maximum predicted reduction was 0.3 deciview; actual reductions in visibility would be significantly less. The BLM considers a change of 1.0 deciview as potentially significant. This criteria was proposed by Pitchford and Malm (1994) and has been adopted by the Grand Canyon Visibility Transport Commission. A 1.0 deciview is defined as "about a 10 percent change in extinction coefficient, which is a small but perceptible scenic change under many circumstances." The USFS has established a more restrictive 0.5 deciview as the "Limit of Acceptable Change" to evaluate potentially significant visibility impacts in the CPWA. But based on either criteria, the Proposed Action and project alternatives would not result in any perceptible visibility impact (even on the cleanest days) in the CPWA.

4.13.3 Cultural Resources

Significant cultural resources or sites on, or eligible for nomination to, the NRHP would not be affected by the Proposed Action. Consequently, we would not anticipate the occurrence of any significant cumulative impacts to cultural resources within the project area as a result of activities associated with either the Proposed Action or other proposed/ongoing activities within the CRNGDPA.

4.13.4 Geology and Minerals

As indicated in Section 4.13, the PRRA, BLM has not received any proposals for additional resource development in or adjacent to the CRNGDPA; consequently, the Proposed Action represents the only reasonably foreseeable resource development in the overall project area. Therefore, we do not anticipate the occurrence of any significant cumulative impacts to existing mineral resources within the CIA as a result of activities associated with the Proposed Action.

4.13.5 Hydrology

4.13.5.1 Surface Hydrology

Additional oil/gas exploration and development activity within the CRNGDPA would not result in a significant impact upon either surface water or watersheds within the CIA area. In this regard, Table 4.9 presents a summary of the cumulative surface disturbance which would be expected within each individual watershed. As indicated therein, implementation of the Proposed Action would not increase the total surface disturbance in any of the affected watersheds above the 10% threshold of significance identified in Section 4.5.2. Surface disturbing activities associated with the Proposed Action would increase total surface disturbance in the 20,515.45 acre CIA by approximately 1% from 2.47% to 3.45%. A 1% increase in overall surface disturbance within the CIA area can not be considered as a significant impact upon the affected watersheds.

As stated in Section 4.5.3.1, a review of aerial photographs taken on June 7, 1996 of the general area failed to reveal any sources of permanent surface water in either the CRNGDPA or the CIA area. Consequently, we do not anticipate any significant cumulative impacts to surface waters or the surface hydrology of the CIA area resulting from surface disturbing activities associated with the Proposed Action.

Table 4.9

Summary of Existing and Proposed Surface Disturbance by Watershed

Name of Watershed	Total Acres in Watershed	Existing Disturbance		Proposed Disturbance		Total Disturbance	
		acres	percent	acres	percent	acres	percent
Adobe	767.20	33.95	4.33	13.40	1.75	47.35	6.17
Poison Creek Tributary	1,779.57	27.16	1.53	2.22	0.13	29.38	1.65
Sand Draw	8,159.74	303.91	3.73	119.02	1.46	422.94	5.18
S. Fork Powder River	6,734.94	122.22	1.82	63.21	0.94	185.44	2.75
Upper Sand Draw	3,074.00	20.37	0.66	2.92	0.10	23.29	0.76
Totals	**20,515.45**	**507.61**	**2.47**	**203.47**	**0.99**	**708.40**	**3.45**

4.13.5.2 Sub-Surface Hydrology

There are no activities (either currently ongoing or proposed) within the CIA area which would result in a significant cumulative impact to the ground water resources thereof.

4.13.6 Range

Existing surface disturbance (203.47 acres) within the CIA area has resulted in the loss of approximately 27.13 AUMs (calculated at 7.5 acres/AUM) to date. The long term disturbance of an additional 287.25 (post reclamation) acres within the CRNGDPA over the LOP would result in the loss of an additional 38.3 AUMs within the CIA area, resulting in the cumulative loss of 65.43 AUMs in the 20,515.45 acre CIA area. This cumulative forage loss represents a 2.39% reduction in available AUMs in the CIA area - which would occur over the life of the project rather than in any single year. The loss of 65.43 AUMs and the subsequent 2.39% overall reduction in available AUMs over the LOP is not considered as a significant impact upon forage availability within the CIA area.

4.13.7 Soils

The discussion of cumulative impacts contained in Section 4.13.5.1 would apply equally to soils within the CIA area as watersheds were used as the basic unit of comparison for soils in this analysis. As indicated in Table 4.9, implementation of the Proposed Action would not increase the total surface disturbance in any of the affected watersheds above the 10% threshold of significance identified in Section 4.5.2. Surface disturbing activities associated with the Proposed Action would increase total surface disturbance in the 20,515.45 acre CIA area by approximately 1% from 2.47% to 3.45%. Considering that sensitive soils within the overall project area will be avoided to the greatest extent possible, a 1% increase in overall surface disturbance within the CIA area can not be considered as a significant impact upon the affected soils within these watersheds.

4.13.8 Visual Resources

As indicated in Section 3.9, the viewshed(s) along both U.S. Highway 20-26 and Natrona County Road 212 have been substantially altered by previous human activity in this area. While implementation of the Proposed Action would increase the overall number of facilities within these viewsheds, the cumulative impact of these facilities upon the landscape would remain consistent with the stated VRM designation for the area.

4.13.9 Wildlife

Table 4.6 indicates that there are currently 203.47 acres of existing surface disturbance within the CIA area. This total includes short-term disturbance associated with oil/gas exploration and development activity which was conducted by Intoil in the CRU during 1997. These disturbed areas will be subjected to an indeterminate amount of reclamation in the near term resulting in an overall reduction in the amount of surface disturbance remaining over the long term (post reclamation disturbance) for the LOP. However, for the purposes of this analysis we will assume that this 203.47 acres of surface disturbance represents post reclamation (or long-term) disturbance. In this regard, post reclamation disturbance under the Proposed Action would add an additional 287.25 acres of disturbance to this existing total, resulting in cumulative surface disturbance of approximately 490.72 acres for the LOP in the CIA area.

4.13.9.1 Economically Important Species

As indicated in Section 3.10.3, Natrona County Road 212 splits the CRNGDPA and also serves as the dividing line between the Rattlesnake and Beaver Rim Antelope and Mule Deer Herd Units. Combined, the Rattlesnake and Beaver Rim Antelope Herd Units encompass approximately 3,538,560 acres in Natrona and Fremont Counties (656,000 and 2,882,560 acres respectively). Likewise, the combined Rattlesnake and Beaver Rim Mule Deer Herd Units encompass approximately 1,693,440 acres in Natrona and Fremont Counties (788,480 and 904,960 acres respectively) (USDI-BLM 1997). The cumulative, long-term loss of 409.72 post reclamation acres in the combined herd units for antelope and mule deer represent less than 0.012% of the total antelope habitat and less than 0.024% of the total mule deer habitat. Direct habitat loss on an individual herd unit basis (assuming that all disturbance occurred in a single herd unit) would represent less than 0.06% and 0.05% of antelope and mule deer habitat in the respective Rattlesnake Herd Units, 0.01% and 0.05% of antelope and mule deer habitat in the respective Beaver Rim Herd Units. Considering

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that no crucial habitat(s) would be impacted by additional oil/gas exploration and development in the CRNGDPA, this direct habitat loss is insignificant.

Cumulative levels of human intrusions into the periphery of these two big game herd units would probably not increase dramatically beyond current levels being experienced therein in association with past and present oil/gas activity in the CRU. Consequently, considering the relative availability of quality, undisturbed wildlife habitat currently existing throughout the Rattlesnake and Beaver Rim Antelope and Mule Deer Herd Units, the fact that the Proposed Action sits on the boundary between the two areas (and that boundary is a fairly well traveled public road), the relatively small amount of habitat to be lost therein, and the lack of any disturbances to critical/crucial wildlife habitat(s) within the CRNGDPA; cumulative impacts to big game populations resulting from activities associated with the Proposed Action and other proposed/ongoing activities within the CRNGDPA can not be considered as significant.

Likewise, as there is no evidence that sage grouse nest or strut within the overall project area, cumulative impacts to this economically important game species are not expected.

4.13.9.2 Raptors

A comprehensive analysis of the cumulative impacts to nesting raptors was conducted in conjunction with the Cave Gulch-Bullfrog-Waltman Natural Gas Development Project Environmental Impact Statement (USDI-BLM 1997). The resultant impact analysis considered the cumulative impacts of human activity on raptor nesting in a 273-square mile area surrounding the Cave Gulch-Bullfrog-Waltman Natural Gas Development Project Area (CGBWNGDPA). The CRNGDPA is completely contained within this 273 square mile CIA area. The CIA for the CGBWNGDPA utilized data collected by Hayden-Wing Associates (HWA) in the 273 square mile Greater Cave Gulch Raptor Analysis Area (GRAA) during the 1996 nesting season. Additional data were collected by HWA in the GRAA during the 1997 nesting season and this data has been incorporated into the discussion below.

Inventories of raptor nesting activity conducted by BLM and HWA in 1996 resulted in the identification of 171 individual nests representing 5 different species of nesting raptors within the GRAA. Of the 171 total nests inventoried in 1996, only 20 were determined to be occupied, with 2 of these active nests located within the CRNGDPA (see Table 3.8). Both of these nests successfully fledged young in 1996. Inventories of raptor nesting activity conducted by AEC, BLM, and HWA in 1997 resulted in the identification of 23 additional nests within (or directly adjacent to) the GRAA and the loss of 14 nests previously identified in 1996 due to various natural causes (HWA 1997). Twenty of the nests inventoried in 1997 were active, with 2 active nests located within the CRNGDPA (one of which subsequently failed).

Disruption of nesting activities in or displacement of nesting raptors from the CRNGDPA would result in an average 10.0% decline in raptor nesting activity in the GRAA, based upon observed nesting activity for 1996 and 1997. Loss of the ferruginous hawk nest which successfully fledged

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young in 1997 (nest 169) would have translated into a 16% reduction in population recruitment for this species within the 273-square mile GRAA for the 1997 nesting season. As the number of active nests observed in both the 1996 and 1997 nesting seasons appears to be fairly constant, these percentages would probably apply to nesting activities in subsequent years as well.

The cumulative impact analysis for the CGBWNGDPA predicted that 3 to 7 pairs of raptors would be displaced in the GRAA without the installation of ANSs. The referenced CIA concluded that "...it is likely that no significant long-term cumulative impact to raptor population production on the GRAA will result from implementation of any of the alternatives" given the application of mitigative measures prescribed therein (USDI-BLM 1997). This document has recommended raptor mitigation measures similar to those recommended in the CGBWNGDPA EIS. Consequently, we must assume that the application of the mitigation measures prescribed in Sections 2.3.9 and 4.9.5 of this document would correspond to the conclusions reached in the CGBWNGDPA EIS regarding cumulative impacts to raptors in the GRAA.

5.0 MITIGATION SUMMARY

5.1 INTRODUCTION

Mitigation measures identified in this chapter summarize specific measures discussed in Chapters 2.0 and 4.0. These measures were developed in response to impacts identified during the course of this analysis and describe how project activities would be implemented to assure compliance with resource management goals identified in the Platte River Resource Area *Resource Management Plan* and the *Oil and Gas Programmatic Environmental Assessment*, applicable lease stipulations, and any additional resource limitations which may have been identified during interdisciplinary team analyses. Mitigation and monitoring measures identified herein may be modified or selectively applied by the Authorized Officer (AO) on the basis of new information or the need to further minimize impacts. In this regard, the Area Manager for the Platte River Resource Area Office, Bureau of Land Management would be the AO for this project and would be responsible for all activities associated with the additional oil/gas exploration and development activity within the CRNGDPA. Final mitigation and monitoring requirements would be determined by the AO after recommendations are received from the appropriate Resource Specialists.

5.2 ADMINISTRATIVE REQUIREMENTS

1. The Operator, as well as their contractors and subcontractors, would conduct operations in full compliance with all applicable Federal and State laws and regulations, and within the guidelines specified in the approved APD's, Sundry Notices, and/or Right-of-Way Grants.

2. All applicable lease stipulations would also be adhered to during the course of additional oil/gas exploration and development activity in the CRNGDPA, unless the AO approves a specific exception in writing. Exceptions would only be granted in those cases where adherence to lease stipulations is either not possible or not necessary, and the action is deemed acceptable with proper mitigation.

5.3 APPLICANT-COMMITTED ENVIRONMENTAL PROTECTION MEASURES

Following is a summary of those mitigation measures which were incorporated directly into the project design by the Operator and enumerated in Chapter 2.0.

5.3.1 Preconstruction Planning and Design Measures

1. The Operator and BLM would conduct on-site inspections of each proposed disturbance site (e.g., well sites, roads, pipelines, etc.) to develop site-specific recommendations and mitigation measures.

2. Roads required for the proposed project would be constructed in accordance with BLM Manual 9113 standards (USDI-BLM 1985b, 1991).

3. The Operator would prepare and submit individual drill site design plans to the BLM for approval prior to initiation of construction. These plans would show the layout of the well location over the existing topography, dimensions of the well pad, volumes and cross-sections of proposed cuts and/or fills, location and dimensions of reserve and flare pits, and access road design.

4. Prior to construction, the Operator would submit a Surface Use Plan or a Plan of Development for each well site, pipeline segment, and access road project. These plans would enumerate the measures and techniques to be used for erosion control, revegetation, and restoration, and would provide specific detail on project administration, time frames, responsible parties, objectives, characteristics of site pre-disturbance conditions, topsoil removal, storage and handling, runoff and erosion control, seed bed preparation, recommended seed mixtures, seed application, fertilization, mulching, site protection, weed and livestock or other herbivore control, and monitoring and maintenance.

5. The Operator would slope stake construction activities on steep and/or unstable slopes when required by the BLM, and would receive approval by the BLM prior to initiating construction.

6. The Operator would identify aggregate and other road material sources for use in drill site and road construction. The appropriate surface management agency would approve these sources, including timing for extraction, prior to use.

5.3.2 Air Quality

1. The Operator would adhere to all applicable Wyoming Ambient Air Quality Standards (WAAQS) and Regulations including those for fugitive dust suppression presented in Wyoming Air Quality Regulations on Fugitive Dust Suppression Section 14(F) (WDEQ 1995). If a fugitive dust problem is identified by the BLM as a result of this project, immediate abatement measures (e.g., applications of water or chemical dust suppressants to disturbed surfaces) would be initiated in consultation with the BLM and WDEQ to avoid exceeding ambient air quality standards.

2. The Operator would not allow open burning of garbage or refuse at well locations or other facilities in the CRNGDPA. Any other open burning would be conducted under the permitting provisions of Section 13 of the Wyoming Air Quality Standards and Regulations (WDEQ 1995).

5.3.3 Cultural Resources

1. The Operator would follow the Section 106 compliance process prior to any surface disturbing activity.

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2. The Operator would halt construction activities if previously undetected cultural resource materials are discovered during construction. The BLM would be immediately notified, and consultation with the SHPO and Advisory Council would be initiated, as appropriate, to determine proper mitigation measures pursuant to 36 CFR 800.11. Construction would not resume until a Notice to Proceed is issued by the BLM.

5.3.4 Geology and Minerals

1. BLM/WOGCC casing and cementing criteria would be followed to protect all subsurface mineral and water-bearing zones.

5.3.5 Hydrology

1. Construction at drainage crossings would be limited to periods of low-or no-flow.
2. The Operator would follow all practical alternatives and designs to limit disturbance within drainage channels, including ephemeral and intermittent draws.
3. A 100-foot wide buffer area of undisturbed land would be left between construction sites and ephemeral and intermittent channels.
4. Channel crossings by pipelines would be constructed so that the pipe is buried at least 4 feet below the channel bottom.
5. Channel crossings by roads and pipelines would be constructed perpendicular to flow.
6. Disturbed channel beds would be reshaped to their approximate original configuration.
7. All reserve pits would be constructed with a minimum of one-half (1/2) the total depth of the pit below the original ground surface on the lowest point within the pit.
8. All reserve pits would be designed with a minimum of 1 foot of freeboard.
9. The discharge of all water (stormwater, produced water, etc.) would be done in conformance with WDEQ-WQD, BLM, and WOGCC rules and regulations (WDEQ 1990; BLM Onshore Oil and Gas Order No. 7).
10. The Operator would prepare SWPPPs for all disturbances as required by WDEQ NPDES permit requirements. In some instances, SWPPPs for groups of wells would be developed.

11. The Operator would implement SPCC Plans if liquid petroleum products or other hazardous materials are stored on-site in sufficient quantities, in accordance with 40 CFR 112.

5.3.6 Range

1. Removal or disturbance of vegetation would be kept to a minimum through construction site management (e.g., by utilizing previously disturbed areas, using existing ROW's, designating limited equipment/material storage yards and staging areas, scalping, etc.) where and as feasible.
2. The Operator would seed and stabilize disturbed areas in accordance with management direction from the appropriate surface management agency or private surface owner, as appropriate.
3. The Operator would monitor for noxious weeds and apply BLM-approved weed control techniques (e.g., soil sterilants, biological controls), as necessary with the prior written approval of the Authorized Officer, BLM.

5.3.7 Soils

1. Prior to commencement of construction activities, all available topsoil (up to a maximum of 12 inches) would be stripped from areas of cut, fill, and subsoil storage, and stockpiled for future reclamation operations.
2. The Operator would keep the area of disturbance to the minimum necessary for drilling and subsequent production activities, while providing for worker safety on site.
3. The Operator would restrict off-road vehicle activity by employees and contract workers.
4. The Operator would restrict project-related travel and reclamation activities during periods when soils are saturated and excessive rutting could occur.
5. Where feasible, the Operator would locate pipelines immediately adjacent to roads or other pipelines to avoid creating separate areas of disturbance.
6. The Operator would minimize construction activities in areas of steep slopes and apply special slope stabilizing structures and techniques (e.g., mulch, matting, etc.) if construction cannot be avoided in these areas.
7. The Operator would not conduct construction and/or reclamation activities using frozen or saturated soils, unless an adequate plan is submitted and approved by the BLM that demonstrates potential impacts would be mitigated.

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8. Runoff and erosion control measures such as water bars, berms, and interceptor ditches would be installed as necessary.

9. All drainage crossing structures would be designed to carry at least a 10-year storm event, pursuant to guidelines contained in BLM Manual, Section 9113 (BLM 1985, 1991a).

10. Upon completion of drilling operations and/or production facility installation, the Operators would restore those areas disturbed in conjunction therewith to the approximate original contours.

11. The Operator would replace topsoil or suitable growth materials over all disturbed surfaces prior to reseeding.

12. The Operator would reseed all disturbed sites as soon as practical following disturbance.

5.3.8 Transportation

1. Existing roads and trails would be utilized to the greatest extent possible and upgraded as necessary to comply with BLM road construction specifications.

2. All roads not required for routine operation and maintenance of producing wells or ancillary facilities would be reclaimed as directed by the BLM, State Land Board, or private landowner. These roads would be permanently blocked, recontoured, reclaimed, and revegetated by the Operator, as would disturbed areas associated with permanently plugged and abandoned wells.

3. The Operator would comply with existing federal, state, and county requirements and restrictions to protect road networks and the traveling public.

4. Special arrangements would be made with the WDOT to transport oversize loads to the project area. Otherwise, load limits would be observed at all times to prevent damage to existing road surfaces.

5. All development activities along approved ROW's would be restricted to areas authorized in the approved ROW.

6. The Operator would be responsible for maintenance of roads in the project area and for closure of roads following production activities.

7. Where proposed roads would follow existing roads, those portions of existing roads not included in the new ROW would be reclaimed and revegetated by the Operator.

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5.3.9 Wildlife

1. Reserve, workover, and evaporation/production pits potentially hazardous to wildlife would be adequately protected (e.g., fencing, netting) to prohibit wildlife access as directed by the BLM, to ensure protection of migratory birds and other wildlife.

2. USFWS and WGFD consultation and coordination would be conducted for all mitigation activities relating to raptors, and T&E species and their habitats and all permits required for movement, removal, and/or establishment of raptor nests would be obtained.

3. The Operator would implement policies designed to control poaching and littering and would notify all employees (contract and company) that conviction of a major game violation could result in disciplinary action. Contractors would be informed that any intentional poaching or littering within the CRNGDPA could result in dismissal.

4. Firearms and dogs would not be allowed on-site during working hours. The Operator has existing drug, alcohol, and firearms policies that would be internally enforced.

5.4 SUGGESTED MITIGATION MEASURES

Mitigation measures identified as a result of impact analyses in Chapter 4.0 have been summarized below by specific resource component.

5.4.1 Air Quality

The air quality impact assessment assumes that water and/or chemical dust suppressants would be applied during construction in order to achieve a 50% control efficiency (at an assumed application rate of 0.02 gallons per square yard every 4 hours) in order to minimize TSP and PM_{10} fugitive dust emissions. In addition, roads constructed on soils susceptible to wind erosion could be graveled, or dust inhibitors could be periodically used on unpaved local, collector or arterial roads which present a fugitive dust problem. The operator could also establish and enforce speed limits for all non-surfaced roads within the CRNGDPA.

5.4.2 Cultural Resources

1. Any cultural or paleontological resource (historic or prehistoric site or object or fossil) discovered by the Operator, or any person working on his behalf, on public or federal land should be immediately reported to the Authorized Officer (AO). The operator should suspend

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all operations in the immediate area of the discovery until written authorization to proceed is issued by the AO. An evaluation of the discovery will be made by the AO to determine the appropriate action(s) to prevent the loss of significant cultural or scientific values. The Operator would be responsible for the cost of evaluation and any decision as to proper mitigation measures would be made by the AO after consulting with the Operator.

5.4.3 Geology and Minerals

No mitigation measures were identified for this particular resource component.

5.4.4 Hydrology

In order to minimize the potential impact(s) of additional oil/gas exploration and development activity within the CRNGDPA to both surface and subsurface waters, the following mitigation measures are recommended.

1. All drilling operations should be conducted with a lined reserve pit in order to prevent drilling water loss and potential contamination of sub-surface water aquifers in the Wind River Formation through seepage. The reserve pit should be lined with a vinyl/plastic liner having a permeability less than or equal to 1×10^{-7} cm/sec. The liner should be chemically compatible with all substances which may be put into the pit and should be installed so that it will not leak.

   Liners made of any man-made synthetic material should be of sufficient strength and thickness to withstand normal installation and pit use and should be installed with sufficient bedding (either straw or dirt) to cover any rocks, should overlap the pit walls, extend under the mud tanks, and be covered with dirt and/or rocks to hold it in place. No trash, scrap pipe, etc. that could puncture the liner should be disposed of in the reserve pit.

2. Emergency and/or production pits associated with oil/gas production operations should consist of either metal or fiberglass tanks rather than earthen pits. Where these tanks are installed in the ground, a leak detection system should be installed to prevent the potential migration of leaking liquid leaking hydrocarbons into the subsurface. Earthen emergency/production pits should not be allowed within the CRNGDPA.

5.4.5 Range

In order to minimize the overall impact to range resources and existing range improvements within the CRNGDPA which could result from additional oil/gas exploration and development activity therein, the following mitigation measures are recommended.

1. To ensure that infestations of noxious weeds are suitably controlled, the proponent should cooperate with the appropriate weed and pest control authority as necessary to implement an integrated pest management program which would be in compliance with all federal and state rules and regulations concerning the application of herbicides or pesticides.

2. In order to maintain the structural integrity of existing fences, wooden "H" braces should be installed on either side of the proposed fence cut and the fence properly tied off, prior to cutting the fence and installation of the required cattleguard.

3. All cattleguards should be routinely maintained for the duration of the project in order to eliminate the potential for any livestock migration to occur.

5.4.6 Soils

In order to minimize impacts to soil resources within the CRNGDPA which could result from surface disturbing activities associated with additional oil/gas exploration and development activity therein, the following mitigation measures are recommended.

1. In order to protect sensitive soils, no occupancy or other surface disturbing activity should be allowed on slopes in excess of 25%.

2. The sensitive soils identified in Table 3.7 should be avoided to the greatest extent possible. In those instances where disturbance of these soils is unavoidable, the proponent should prepare a site specific Erosion Control, Reclamation and Revegetation Plan which sets forth the construction, reclamation, and revegetation techniques to be implemented in conjunction with the proposed surface disturbing activity.

3. All available topsoil (e.g., 6 to 12 inches) should be removed (stripped) from the areas of new construction and stockpiled for future reclamation of these disturbed areas. This stored topsoil, as well as cut and fill slopes on the well pad, should be secured from erosion through mulching and temporary revegetation (hydroseeding) if reclamation is not anticipated within one (1) year following initial construction.

4. Unused areas (borrow ditch) along the proposed access road route(s) which would be denuded of existing vegetation during initial construction should be reseeded in order to re-establish vegetative cover and reduce the overall potential for erosion and off-site sedimentation.

5.4.7 Visual Resources

In order to minimize the potential impact(s) of additional oil/gas exploration and development activity within the CRNGDPA to the visual resource (viewshed), the following mitigation measures are recommended.

1. All permanent (on-site for six months or longer) above-ground structures constructed or installed on the individual well locations (including pumping units, tank batteries, etc.) should be painted a flat, non-reflective, earthtone color to match one of the standard environmental colors as determined by the Five (5) State Rocky Mountain Interagency Committee.

   Those facilities required to comply with Occupational Safety and Health Act (OSHA) rules and regulations would be excluded from this painting recommendation.

5.4.8 Wildlife

As a result of this analysis process, the following mitigation measures are recommended to minimize impacts to wildlife resulting from additional oil/gas exploration and development activity within the CRNGDPA.

1. All project workers should be instructed about the nature of raptor species that occur on the project area, potential impacts to these species, and measures that can be taken to avoid or minimize impacts. They should also be advised of federal and state regulations and laws concerning harassment and illegal kill of raptor species.

2. If above-ground power lines are installed, power pole cross arms should be configured by the owner of the power line according to specifications described in Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996 (Avian Power Line Interaction Committee) so as to eliminate the potential for raptor electrocution.

3. Seasonal restrictions of construction activities within 1/4 mile of occupied raptor nests should be applied. An occupied nest is defined as one where eggs or young are being incubated or tended. Occupied nests should be protected during the nesting period until the young have safely fledged. Normally the exclusionary time window for nesting activities extends from February 1 through July 31 for golden eagles and from March 15 through July 31 for other species. The AO may modify these dates depending on the specific circumstances surrounding individual nests.

   Seasonal restrictions should be applied as follows:

   - Any activity initiated prior to February 1 may be completely finished. This means a well may be permitted (casual uses), drilled, completed, and hooked up without restrictions unless activities on the drill site cease for 3 weeks or longer between February 1 and June 1. In the event of such prolonged inactivity, a nest survey must be performed in the 1/4-mile radius surrounding the drill site to determine whether or not an occupied nest has been established during the period of inactivity. If an occupied nest is found, the operation must temporarily cease until the young have fledged.

- Any activity initiated between February 1 and June 1 should require a nest check either by the BLM or an Operator representative approved by the BLM within 1/4 mile; if an occupied nest is present, activity would be restricted during the critical period.

4. Casual use activities away from existing roads and facilities that are scheduled to occur between March 1 and mid-June should be coordinated with the BLM in order to minimize or avoid potential impacts to nesting raptors in the area.

   Casual uses include, but are not limited to, ground activities such as: (1) preliminary scouting of routes or sites, (2) land surveying and staking, and (3) cultural and wildlife surveys. Because casual use is generally not treated as a managed or permitted activity, there is a potential for causing impacts to nesting raptors.

5. Raptor nests that are discovered by the Operator or Operator's representatives should not be approached and should be immediately reported to the BLM. Employees should be directed not to enter buffer zones, established by the BLM to reduce stress to raptor adults or young and to prevent nest abandonment.

6. The operator should construct Artificial Nest Structures (ANSs) in those raptor territories where permanent facilities are established which would/could compromise the functionality of existing nest structures as outlined below. These new nest structures (ANSs) should be installed in areas which are farthest removed from proposed well sites and on-going human activity in order to maximize nest site alternatives within the affected territories. The operator should obtain the necessary authorizations from and coordinate the installation of ANSs with the appropriate federal and state regulatory agencies prior to the installation thereof.

   In order to mitigate impacts to those raptor nesting territories encompassing nest numbers 64/65 and 169/170, the operator should install a minimum of two ANSs per territory as outlined above. As the 1998 nesting season is already underway, these ANSs should be installed subsequent to the 1998 nesting season and prior to November 15, 1998. Pending the results of potential exploration and development activity as proposed in Table 2.1, placement of these nesting structures is tentatively recommended as follows:

   a) Ferruginous Hawk Southern Nesting Territory (nests 169 and 170):

      1. Place one structure in the SE¼SE¼ of Section 9, Township 35 North, Range 87 West. This particular location is between two abandoned wells (CRU #1 and CRU #4); consequently, additional exploration and development in this corner of the CRNGDPA is unlikely. The proposed ANS would be located on federal surface at a minimum of 2,000 feet from both Natrona County Road 212 and the existing access into the CRU #6.

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2. The second ANS should be placed in the NE¼SW¼SW¼ of Section 11, Township 35 North, Range 87 West on the south side of the South Fork of the Powder River. As above, this area is removed from existing and/or currently proposed development within the CRU and the potential for future development in this corner of the CRNGDPA is considered to be remote.

b) Ferruginous Hawk Northern Nesting Territory (nests 64 and 65):

1. Nest numbers 64 and 65 are located not only in the heart of the proposed CRNGDPA but also within an extensive block of private surface (see Figure 1.4), making placement of ANSs on public lands within a reasonable radius (within the territory) of the existing nests most difficult. Consequently, it is recommended that placement of these ANSs be delayed until after the results of the 1998 drilling season are known. Once a determination of commercial productivity of these wells has been made, Intoil should arrange a meeting with BLM, USFWS, WGFD, and the private surface owners to discuss ANS placement in or adjacent to the CRNGDPA and/or possible alternatives. If for some reason the proposed ANSs can not be located within this particular nesting territory, the structures would be located in an alternate area to be provided by BLM. Conditions of Approval (COAs) would be attached to permits for wells proposed within 1/4 mile of these nests which would require that 2 ANSs be installed after the nesting season and prior to November 15, 1998 if commercial production is achieved.

c) Golden Eagle Nesting Territory (nest 192):

1. In order to mitigate potential impacts to the golden eagle nesting territory encompassing nest 192, the operator should install a minimum of two ANSs as outlined above. These ANSs should be installed only in the event that commercial production is established by Intoil within a one-half (1/2) mile radius of the existing nest structure and ongoing nesting inventories verify future use of the nest by golden eagles. As nest number 192 is also located in an area of extensive private and/or State of Wyoming surface ownership (see Figure 1.4), a meeting should be scheduled with BLM, USFWS, WGFD, and the private surface owner/grazing lessee to discuss ANS placement as soon as possible after production has been established in proximity to the subject nest. If for some reason the proposed ANSs can not be located within this particular nesting territory, the structures would be located in an alternate area to be provided by BLM. Conditions of Approval (COAs) would be attached to permits for wells proposed within 1/4 mile of these nests which would require that 2 ANSs be installed after the nesting season and prior to November 15*th* of the following year if commercial production is achieved.

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6.0 CONSULTATION AND COORDINATION

6.1 BACKGROUND

A field development environmental assessment (EA) was submitted to the BLM PRRA in May 1996 by Intoil for additional national gas development in the Cooper Reservoir Unit. The subject EA was submitted to BLM during the scoping period for the Cave Gulch-Bullfrog-Waltman Natural Gas Development Project (CGBWNGDP) Environmental Impact Statement (EIS). In conjunction with scoping for the CGBWNGDP EIS, BLM's Wyoming Reservoir Management Group (WRMG) prepared a Preliminary Reservoir Analysis of the CGBWNGDP, with said analysis completed by the WRMG on February 20, 1996. This analysis, along with the subsequent Final Geologic, Well Spacing, and Reserve Evaluation Report on the CGBWNGDP (completed by BLM's WRMG on June 3, 1996) determined the Cooper Reservoir Natural Gas Development Project to be geologically separate from the Cave Gulch-Bullfrog-Waltman Project Area. However, it was determined by the BLM PRRA that activities proposed in both project areas would cumulatively contribute to the anticipated impacts upon air quality and raptor habitat; consequently, the environmental analyses of both projects were to be completed concurrently. The CGBWNGDP EIS was completed in August 1997; however, staffing constraints precluded the preparation of a concurrent analysis of the Cooper Reservoir Natural Gas Development Project.

The Cooper Reservoir Natural Gas Development Project Environmental Assessment was prepared by an independent environmental consulting firm, with the guidance, participation, and independent evaluation of the Bureau of Land Management. A list of the personnel responsible for document preparation, and their individual responsibilities are provided in Section 6.4.

6.2 PUBLIC PARTICIPATION

Public participation, consultation, and coordination for the proposed Cooper Reservoir Natural Gas Development Project occurred through press releases, public meetings, scoping notices, and individual contacts. Some of these occurred while the CGBWNGDP EIS was being prepared; others occurred subsequent to signing of the CGBWNGDP EIS Record of Decision. The contact dates and actions taken are summarized below. All of the information is available for review at the BLM PRRA office in Mills, Wyoming.

1. June 14, 1996. BLM issued a press release informing the public of an open house scheduled for June 20 to discuss Intoil, Inc.'s proposed Natural Gas Interim Development Plans for the Cooper Reservoir Unit area. The plan provided for 5 federal wells to be drilled in 1996 while the environmental assessment for the natural gas development project was being prepared.

2. June 20, 1996. An open house was held to discuss development of federal oil and gas leases in the Cooper Reservoir Unit area during preparation of the environmental assessment for the natural gas development project. The open house was attended by 32 people.

3. May 13, 1997. A scoping notice was mailed to agencies, organizations, entities, and those individuals who attended the open house on June 20, 1996 in order to gather information that would aid in the identification of potentially significant issues and concerns relative to proposals from Intoil, Inc. and Prima Oil & Gas Company to drill 19 additional wells within a 1,842.07 acre project area.

4. May 15, 1997. BLM issued a statewide press release informing the public that Platte River Resource Area was conducting scoping regarding natural gas development in the Cooper Reservoir field. Additional information provided in the release was the proximity of Cooper Reservoir to the Cave Gulch-Bullfrog-Waltman project area. The release further explained that while Cooper Reservoir had been determined to be geologically separate from the Cave Gulch project, the cumulative effects of proposed development in both areas would be considered for air quality and raptor nesting habitat.

5. November 13, 1997. A second scoping notice was mailed to agencies, organizations, entities, and those individuals who responded to the May 1997 scoping notice and/or attended the open house held on June 20, 1996 to gather information concerning the expansion of the project area to a maximum of 85 wells, affecting a total of 6,282.38 acres.

6. November 14, 1997. A scoping notice was mailed to representatives of Native American Tribes requesting their help in identifying any sensitive sites in the Cooper Reservoir area which might require special consideration for spiritual, cultural, or historical reasons.

7. November 20, 1997. BLM issued a statewide press release informing the public of the expansion of the Cooper Reservoir Natural Gas Development Project Area to a maximum of 85 wells, affecting 6,282.38 acres.

8. February 23, 1998. BLM personnel met with the District Ranger and the Cloud Peak Wilderness Coordinator, USDA Forest Service, Buffalo Ranger District to gather information on issues and concerns relative to air quality in the Bighorn National Forest and specifically in the Cloud Peak Wilderness Area.

As a result of the public participation process, one written comment was received at the open house of June 20, 1996. Six comments were received during the initial scoping period during May/June of 1997; and an additional four comments were received during the second scoping period during November/December of 1997.

6.3 AGENCIES, INDIVIDUALS AND ORGANIZATIONS CONTACTED

As indicated above, numerous contacts have been made during the course of this environmental analysis. The following agencies, organizations, entities, and individuals (or their representatives) who responded to scoping notices and/or attended the open house referenced in Section 6.2 were notified during the preparation of this analysis document. Separate consultations were conducted with many of the state and federal agencies identified below in order to obtain specific information concerning potential impacts to individual resources within their jurisdictional purview.

6.3.1 Federal Government/Federal Agencies Contacted

1. Congressional Delegation for the State of Wyoming
    a. Representative Barbara Cubin, Field Office: Casper Wyoming
    b. Senator Mike Enzi, Field Office: Casper, Wyoming
    c. Senator Craig Thomas, Field Office: Casper, Wyoming
2. Department of Agriculture
    a. U.S. Forest Service, Buffalo Ranger District; Buffalo, Wyoming
    b. U.S. Forest Service, Douglas Ranger District; Douglas, Wyoming
    c. U.S. Forest Service, Rocky Mountain Region, Lakewood, Colorado
3. Department of Defense
    a. U.S. Army Corps of Engineers; Omaha, Nebraska
    b. U.S. Army Corps of Engineers; Cheyenne, Wyoming
4. Department of the Interior
    a. U.S. Fish and Wildlife Service; Cheyenne, Wyoming
5. Environmental Protection Agency
    a. Region VIII; Denver, Colorado

6.3.2 State of Wyoming Contacts

1. Honorable Jim Geringer, Governor; Cheyenne, Wyoming
2. Department of Environmental Quality; Cheyenne, Wyoming
3. Department of Transportation; Casper, Wyoming
4. Federal Land Policy Office; Cheyenne, Wyoming
5. Game and Fish Department; Casper, Wyoming
6. Game and Fish Department; Cheyenne, Wyoming
7. Game and Fish Department; Lander, Wyoming
8. Oil and Gas Conservation Commission; Casper, Wyoming
9. Representative Bruce Hinchey, Wyoming State Legislature; Casper, Wyoming
10. State Engineer; Cheyenne, Wyoming
11. State Land and Investments Office; Cheyenne, Wyoming

6.3.3 Local Governments/Organizations Contacted

1. Natrona County Commissioners; Casper, Wyoming
2. Natrona County Planner; Casper, Wyoming
3. Natrona County Treasurer; Casper, Wyoming

6.3.4 Individuals, Citizens Groups, and Regional Societies Contacted

1. Velma Pingetzer, Deer Creek Ranch; Shoshoni, Wyoming
2. Greg Mohl, Casper, Wyoming
3. J.W. MacGuire; Casper, Wyoming
4. Kit Jennings; Casper, Wyoming
5. Mike Kozimko; Midland, Texas

6. Pauline Hitt; Casper, Wyoming
7. Ty Perkins; Casper, Wyoming
8. Murie Audubon Society; Casper, Wyoming
9. Wyoming Outdoor Council; Lander, Wyoming

6.3.5 Industry/Business Contacts

1. Double Eagle Petroleum & Mining Company; Casper, Wyoming
2. Frontier Well Service Inc.; Casper, Wyoming
3. Halliburton Energy Services, Inc.; Evansville, Wyoming
4. Halliburton Energy Services, Inc.; Mills, Wyoming
5. Heitzman Drill-Site Services; Casper, Wyoming
6. Hose & Rubber Supply; Casper, Wyoming
7. Inter-Mountain Pipe Company; Casper, Wyoming
8. Intoil, Inc.; Englewood, Colorado
9. KN Energy, Inc.; Casper, Wyoming
10. Petroleum Association of Wyoming; Casper, Wyoming
11. Prima Oil & Gas Company; Denver, Colorado
12. Pronghorn Archaeological Services; Mills, Wyoming
13. SST Energy Corporation; Casper, Wyoming
14. Sierra Resources, LLC; Casper, Wyoming
15. SWACO; Casper, Wyoming
16. Thunder Basin Environmental Consulting; Casper, Wyoming
17. Weatherford Enterra U.S., Inc.; Casper, Wyoming

6.3.6 Native American Interests Contacted

1. Crow Tribal Administration; Crow Agency, Montana
2. Crow Tribal Council; Crow Agency, Montana
3. Del Clair, Eastern Shoshone Traditional Elder; Fort Washakie, Wyoming
4. Eastern Shoshone Business Council; Fort Washakie, Wyoming
5. Eastern Shoshone Tribal Council; Fort Washakie, Wyoming
6. Eastern Shoshone Tribal Preservation Office; Fort Washakie, Wyoming
7. Francis Brown, Northern Arapaho Spiritual Leader; Kinnear, Wyoming
8. Haman Wise, Eastern Shoshone Traditional Elder; Fort Washakie, Wyoming
9. Harold Smith, Northern Arapaho Traditional Elder; Kinnear, Wyoming
10. John Schumacker, Eastern Shoshone Tribal Attorney; Fort Washakie, Wyoming
11. Medicine Wheel Alliance; Crow Agency, Montana
12. Medicine Wheel Coalition for Sacred Sites of North America; Fort Washakie, Wyoming
13. Northern Arapaho Business Council; Fort Washakie, Wyoming
14. Northern Arapaho Tribal Council; Fort Washakie, Wyoming
15. Northern Cheyenne Cultural Committee; Lame Deer, Montana
16. Northern Cheyenne Tribal Council; Lame Deer, Montana
17. Oglala Lakota Nation; Pine Ridge, South Dakota
18. Oglala Sioux Tribal Administration; Pine Ridge, South Dakota
19. Steven Brady, Northern Cheyenne Spokesman; Lame Deer, Montana

6.4 LIST OF PREPARERS

The following tables identify those BLM and consulting individuals that played a key role in the preparation of this Environmental Assessment.

Table 6.1

Interdisciplinary Reviewers from the Bureau of Land Management

Name	Title
Platte River Resource Area Office	
Linda Slone	Project Lead, Environmental Protection Specialist
Chris Arthur	Archaeologist
Willie Fitzgerald	Wildlife Biologist
John Menghini	Petroleum Engineer
Mike Phillips	Rangeland Management Specialist
Rod Sanders	Outdoor Recreation Planner
Celia Skillman	Realty Specialist
Casper District Office	
Laurie Bryant	Paleontologist
Joe Meyer	Soil Scientist
Roger Miller	Geologist
Wyoming State Office	
Ron Hilton	Environmental Scientist
Richard Schuler	Physical Scientist
Roger Wickstrom	Natural Resource Scientist
National Applied Resources Science Center	
Scott F. Archer	Senior Air Resource Specialist

Table 6.2

Principal Interdisciplinary Team

Name	Affiliation	Responsibility
Robert M. Anderson	Anderson Environmental Consulting	Project Manager, Principal Author
Michelle Ayers	TRC Environmental Corporation	Air Quality
Marvin L Hatcher	Pronghorn Archaeological Services	Cultural Resources
Tracy Henline	Uintah Engineering & Land Surveying, Inc.	Cartography
Hal Marshall	Uintah Engineering & Land Surveying, Inc.	Cartography
James G. Zapert	TRC Environmental Corporation	Air Quality

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8.0 ABBREVIATIONS

AACL	State Acceptable Ambient Concentration Levels
ACEC	Area of Critical Environmental Concern
AEC	Anderson Environmental Consulting
ANC	Acid Neutralizing Capacity
ANS	Artificial Nest Structures
APD	Application for Permit to Drill
API	American Petroleum Institute
AO	Authorized Officer
AUM	Animal Unit Month
BACT	Best Available Control Technology
BCPD	Barrels of Condensate per Day
BLM	Bureau of Land Management
BMP	Best Management Practices
BOPE	Blowout Prevention Equipment
BWPD	Barrels of Water per Day
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CGBWNGDPA	Cave Gulch-Bullfrog-Waltman Nateral Gas Development Project Area
CGBWNGDP	Cave Gulch-Bullfrog-Waltman Natural Gas Development Project
CIA	Cumulative Impacts Analysis
CO	Carbon monoxide
COA	Condition of Approval
CPWA	Cloud Peak Wilderness Area
CRNGDPA	Cooper Reservoir Natural Gas Development Project Area
CRU	Cooper Reservoir Unit
D/A	Drilled and abandoned
DR	Decision Record
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
°F	Degrees Fahrenheit
FLPMA	Federal Land Policy Management Act
FONSI	Finding of No Significant Impact
FOOGLRA	Federal Onshore Oil and Gas Leasing Reform Act
FOOGRMA	Federal Onshore Oil and Gas Royalty Management Act
FR	Federal Register
GPM	Gallons per Minute
GRAA	Greater Raptor Analysis Area

HAP	Hazardous Air Pollutants
HP	Horsepower
H_2S	Hydrogen Sulfide
HWA	Hayden-Wing Associates
INJ	Injection well
IWAQM	Interagency Workgroup on Air Quality Modeling
KCl	Potassium Chloride
kg/ha-yr	Kilograms per hectare-year
KGS	Known Geologic Structure
km	Kilometer
km^2	Square kilometer
KNE	KN Energy, Inc.
LFU	Lower Fort Union Formation
LFU/L	Lower Fort Union/Lance undifferentiated Formation
LOP	Life of Project
MEI	Maximally Exposed Individual
MLA	Mineral Leasing Act of 1920
MLE	Most Likely Exposure
MCFGPD	Thousand Cubic Feet of Gas per Day
MCF	Thousand Cubic Feet
MMCFGPD	Million Cubic Feet of Gas per Day
MSLE	Modified Soil Loss Equation
NAAQS	National Ambient Air Quality Standards
NCR	Natrona County Road
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NOS	Notice of Staking
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxides (oxides of nitrogen)
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
O_3	Ozone
OOGO	Onshore Oil and Gas Order
OSHA	Occupational Safety and Health Act
P/A	Plugged and abandoned
PGW	Producing gas well
PM_{10}	Particulate matter with an effective diameter less than 10 microns
PPM	Parts per Million
PRRA	Platte River Resource Area
PSD	Prevention of Significant Deterioration
RMG	Reservoir Management Group
RMP	Resource Management Plan
ROD	Record of Decision
ROW	Right-of-Way

SARA	Superfund Amendments and Reauthorization Act
SHPO	State Historic Preservation Officer
SI	Shut-in
SMA	Surface Management Agency
SO_2	Sulfur dioxide
SO_x	Sulfur oxides (oxides of sulfur)
SPCC	Spill Prevention, Containment and Countermeasure Plan
SVR	Standard Visual Range
SWPPP	Stormwater Pollution Prevention Plan
T/A	Temporarily abandoned
TCLP	Toxicity Constituent Leaching Process
T/E	Threatened and Endangered Species
TPH	Total Petroleum Hydrocarbons
TSP	Total Suspended Particulates
UFU	Upper Fort Union Formation
UIC	Underground Injection Control
μeq/l	Microequivalents per liter
$\mu g/m^3$	Micrograms per cubic meter
USC	United States Code
USDA	U.S. Department of Agriculture
- FS	Forest Service
- SCS	Soil Conservation Service
USDI	U.S. Department of the Interior
USFWS	U.S. Fish and Wildlife Service
VOC	Volatile Organic Compound
VRM	Visual Resource Management
WAAQS	Wyoming Ambient Air Quality Standards
WDEQ	Wyoming Department of Environmental Quality
- AQD	Air Quality Division
- LQD	Land Quality Division
- WQD	Water Quality Division
WDOT	Wyoming Department of Transportation
WGFD	Wyoming Game and Fish Department
WNDDB	Wyoming Natural Diversity Database
WOC	Waiting on completion
WOGCC	Wyoming Oil and Gas Conservation Commission
WOS	Wildlife Observation System
WSA	Wilderness Study Area
WSW	Water Supply Well
yd^3	cubic yards

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